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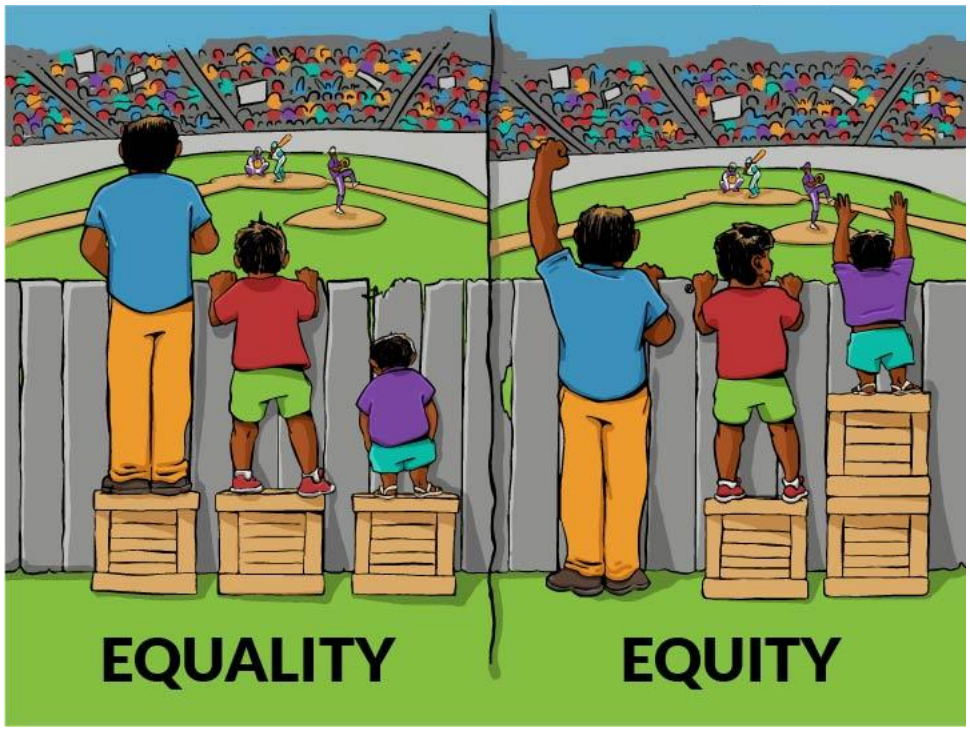
DEVELOPING A PLANNING AND MONITORING FRAMEWORK FOR EQUITY IN THE ZAMBIA EDUCATION SYSTEM



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DEVELOPING A PLANNING AND MONITORING FRAMEWORK FOR EQUITY IN THE ZAMBIA EDUCATION SYSTEM

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CONTENTS

Acronyms iii
Tables and figures iv
Executive summary 1
Introduction 11
Purpose and objectives 11
Data sources, methodology and limitations 11
Organization of the document 12
Education equity 14
Equity as a policy imperative 14
Measuring equity 15
Equity in policy priorities in Zambia 16
Mapping equity in education in Zambia 18
Educational attainment 18
Learning outcomes 23
Equity and investment 25
Resources, investment, and educational attainment 26
Resources, investment, and transition to post-primary education 31
Resources, investment, and learning outcomes 36
Summary and recommendations for planning and monitoring for equity 40
Physical accessibility of schools 42
Age of students 43
Teacher allocation and quality 44
Early education 44
School facilities 44
Gender 45
Supplemental support for students 46
Comprehensive equity in school resources 47
References 50
Annex 1: Multivariate analysis of Grade 4 and Grade 7 survival rates 51
Annex 2: Multivariate analysis of the transition to post-primary education 54
Annex 3: Multivariate analysis of learning outcomes (Grade 7) 55
Annex 4: District characteristics and learning outcomes 57
Annex 5: Indicators for a proposed district equity index 58

ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
CSEN	Children with Special Education Needs
ECE	Early Childhood Education
ECZ	Examination Council of Zambia
EMIS	Education Management Information System
GRZ	Government of the Republic of Zambia
HIV	Human Immunodeficiency Virus
MOGE	Ministry of General Education
MDG	Millennium Development Goals
NIF	National Implementation Framework
OVC	Orphan and Vulnerable Children
PTR	Pupil-Teacher Ratio
SEN	Special Education Needs
SHN	School Health and Nutrition
SNDP	Sixth National Development Plan
STEP-Up	Strengthening Educational Performance – Up Zambia Project
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development

TABLES AND FIGURES

Table 1: National Aggregate Survival Rates 18
Table 2: Interquartile Range for Survival Rates 19
Table 3. Distribution of School-Level Grade 4 Survival Rates 20
Table 4: Distribution of School-Level Grade 7 Survival Rates 21
Table 5. Distribution of Grade 7 and Grade 9 Exam Results 24
Table 6: Correlation Between School Resources and Survival Rates 35
Table 7. Summary of School-Level Grade 7 Exam Results 36
Table 8: Correlations Between G7 Learning Outcomes and School Resources (School Level) 37
Table 9: Correlations Between District G7 and G9 learning Outcomes and School Resources (District School Level Means 39

Figure 1. Grade 9 Survival Rates at Zone Level 22
Figure 2: District Grade 7 to Grade 8 Transition 31
Figure 3: District Transition to Post-Primary Education and Age of Students 32
Figure 4: Accessibility to Grade 8 and Transition to Post-Primary Education 33

EXECUTIVE SUMMARY

In an equitable education system, the amount of education a child completes and the skills he/she develops are determined by his/her innate capacity rather than disadvantages or barriers he/she encounters. While rights and fairness are prioritized in international norms and conventions as well as many national policies in Zambia, policy implementation and budgeting have traditionally viewed the "costs" of improving fairness as something that had to be balanced against competing notions of efficiency.

Experience in the last 25 years in multiple sectors has demonstrated that, in many cases, policies focused on equity are also cost-effective alternatives for improving overall outcomes in health, social protection, and education. The significant expansion of education systems in developing countries (especially the poorest) have significantly improved participation rates. Despite this commitment, too many children remain outside the system entirely, completing very few years of schooling or unable to acquire necessary skills. Moving beyond the relatively low hanging fruit of mass participation requires policies and strategies to address the barriers experienced by this large group of children.

This analysis of equity in Zambia's education system was undertaken as part of the support provided by the USAID-funded Strengthening Educational Performance- Up (STEP-Up) project to the Ministry of General Education (MOGE) to strengthen systems and capacity for decision making and to promote equity as a central theme in education management and reform.

The objectives for the analysis are to:

- Assess equity in the current delivery of education in terms of outcomes and investments.
- Analyze the distribution of education investments and education outcomes identifying key relationships between investment and outcomes.
- Elaborate draft benchmarks/indicators for monitoring progress on equity at the national, provincial, and district levels (with focus on district level) using existing data sources.
- Develop recommendations for priority actions for improving equity in the system.

Strengthening systems for decision making at the subnational level is a strategic focus of STEP-Up Zambia. The emphasis in this analysis of equity is on providing an actionable framework to strengthen systems for planning and decision making at the district level.

The objective of a policy focus on equity is to improve outcomes. In developing the framework for assessing equity, two outcome measures were used: persistence in school as measured by estimated survival rates to Grades 4, 7, 9 and 12 and learning

outcomes captured in annual national examinations in mathematics and English at Grades 7, 9, and 12.[1]

The proposed indicators and benchmarks have been identified via an assessment of how outcomes vary across pupils and schools and the relationship between differences in student outcomes and the characteristics of schools (gender/age of students, teacher characteristics, infrastructure, materials, bursaries, etc.). Outcomes were also assessed relative to differences in resources available to schools as captured by an investment model that calculates a monetary per student equivalent of infrastructure, furniture, materials, teachers, and supplemental support for pupils (bursaries and boarding places).

The proposed indicators are not comprehensive indicators of education system performance, but rather suggested additions for strengthening the equity focus of other decision-support systems being managed by the Ministry. Notable among current efforts to develop decisions-support systems are the ongoing refinement of the Ministry's Evaluation Plan, the renewal and refinement of the district monitoring system through collaboration with the UNICEF-assisted Let Data Speak initiative, and support for operational time-sensitive decision support at the district level (Local Monitoring System) developed with support of the STEP-Up Zambia project.

The document explores the use of existing data sources for monitoring equity. While the use of these sources has obvious advantages in avoiding additional expensive data gathering, they also have important limitations. Individual, household, and community factors play an important role in student outcomes. However, the education sector data limits the analysis to an examination of the relationship between outcomes and the characteristics of schools.

The education sector data is also aggregated at the level of schools and classes, not individual students. While it may be possible to identify relationships between better or poorer outcomes and the characteristics of schools, caution must be used in attributing the "cause" of poor outcomes. For example, knowing that schools with very low pupil-teacher ratios (PTRs)[2] have poorer results may be a good predictor of results or a useful indicator to track, however it does not explain why results are poor or offer an immediate policy solution.

Finally, the use of existing data as a source of information for monitoring and planning for equity requires that the analysis focus on how outcomes and the characteristics of schools are distributed. This focus on individual schools as the unit of analysis is more sensitive to errors in data reporting and capture than using the same data to report aggregate results for the nation, region, or district. For example, a reporting error at the school level could result in a promotion rate of greater than 100 percent while this individual school reporting error would have very little impact on a promotion rate calculated for an entire district. Making these errors more visible is a necessary trade-off when using existing data sources to plan and monitor for equity. While these outlier results attract attention, they are relatively few and if

[1] English and mathematics were chosen as they are core competencies in the Zambian curriculum.
[2] Low-PTR schools are defined in this report as schools with one teacher for fewer than 30 students.

one assumes that these errors are random they should not bias the analysis of school characteristics and outcomes.

The analysis yielded a number of relationships between outcomes (survival rates and exam results) and school characteristics. Most of these relationships were identified using multivariate methods that estimate the "unique" or net impact of a particular school characteristic on outcomes. Using again the example of low-PTR schools, the analysis estimated the impact of a school having a low pupil-teacher ratio independent of other factors, such as teachers, age of students, region/district, type of school (public/private/community), etc.

These relationships or associations suggest potential benchmarks or indicators for use in planning and monitoring for improving equity in the education system. In each case, the results are linked to implications for policy and for monitoring and evaluation. Many of the proposed benchmarks or indicators have been operationalized in a proposed district equity framework described in Annex 5.

PHYSICAL ACCESSIBILITY OF SCHOOLS

Survival rates to Grade 4 are much higher in **schools that offer at least seven grades** than in schools with similar resources that offer fewer than seven grades regardless of the type of school. While the mean across all districts is 84 percent of primary schools offering seven grades or more, in about 20 percent of districts 25 percent or more of the pupils attend schools that do not offer Grade 7. System-wide, about 23 percent of primary grade pupils attend a school that does not reach Grade 7.

Policy recommendation: Accelerate the provision of complete primary schools (to Grade 7) will improve equity and overall Grade 4 and Grade 7 survival rates.

M&E: Track over time the percent of the district's primary enrollment that attends a "complete" primary school (number of pupils attending school with Grade 7/total basic education enrollment).

Low-PTR schools (measured by pupil-teacher ratios under 30 to 1) lose about 10 percent more of their pupils before Grade 4 than equally resourced, typically sized schools (student-teacher ratio between 30 and 60 to 1) or even overcrowded schools (student-teacher ratios 85 to 1 and above). Since lower student-teacher ratios are generally assumed to promote positive results, this relationship suggests that there are other factors common to this group of schools that are responsible for their lower survival rates. The reasons for lower survival rates may also differ across these schools. While the analysis of the available education data does not explain why these schools have lower survival rates, efforts to track low-PTR school performance and address the underlying causes would contribute to improved equity.

Policy recommendation: Invest and support appropriate interventions to improve performance in low-PTR schools. Improving the results in such schools (which are often small and isolated) reduces inequity linked to barriers of geographical and local development disadvantages.

M&E: Annually track the performance (repetition, dropout, survival) of low-PTR schools relative to overall district performance.

Survival rates to Grade 4 in **community schools** were about 25 percent lower when compared to public and private schools with similar levels of resources. This suggests that the lower survival rates in community schools are not attributable to differences in school resources but rather to other factors like the management of school programs or the types of communities served by the schools.

Policy recommendation: Raise community school performance to parity with public schools through well-targeted additional support and investments, which could improve both equity and overall rates of educational attainment in the district.

M&E: Annually track the performance (repetition, dropout, survival) of community schools relative to overall district performance

The **distribution of opportunities for post-primary schooling** (Grade 8 and above) is associated with differences in transition rates to post-primary schooling. Transition rates from primary to post-primary education (Grade 7 to Grade 8) were lower in districts where the provision of Grade 8 was available in a lower percentage of zones within the district. This relationship suggests that it is not only the number of school places available for post-primary schooling (Grade 8 in this case), but also how those places are distributed geographically. The more widely distributed the opportunities to continue to Grade 8, the higher the rate of transition.

Policy recommendation: Improve geographical access/distribution to post-primary grades to improve equity in educational attainment (rather than focus on aggregate number of places — distribution is also important).

M&E: Monitor the distribution of post-primary grade school places. (By zone, ward or other appropriate administrative region — ratio of Grade 7 pupils to Grade 8 capacity — or alternative grade transition depending on the district.)

AGE OF STUDENTS

The percentage of pupils overage for grade[3] in a school was not associated with lower survival rates to Grade 4. However, schools with larger percentages of overage pupils tended to have lower Grade 7 survival rates than similar schools with fewer overage students. In transitioning to post-primary education measured at the district level, a 10 percent higher proportion of Grade 7 pupils overage for grade was associated with a 2.4 percent lower Grade 7 to Grade 8 transition. The analysis suggests that pupils do remain in school despite being overage until they begin to reach an age where they can make other contributions to the household.

Being overage for grade can result from late entry to Grade 1, repetition, dropping out and reentering, or a combination of the three. A quick calculation for 2014 suggests that as many as 20 percent of the Grade 1 enrolling pupils begin schooling already more than two years behind grade.

[3] Two years older than typical age for the grade assuming Grade 1 entry at official age of 7 years.

Policy recommendation: Promote entry into Grade 1 at the official age of 7 years. Identify schools with high levels of repetition or poor grade-to-grade transition in early grades.

M&E: Track age of Grade 1 entry in district schools as well as the percentage of overage children in early grades.

TEACHER ALLOCATION AND QUALITY

Differences in the **quantity and quality of teachers** in a school was associated with school-level variations in survival rates. Schools with higher average years of teacher experience had higher survival rates to Grade 4 and Grade 7 than similar schools with less experienced teachers. Schools that had 25 percent or more unqualified teachers had lower expected Grade 4 (by 20 percent) and Grade 7 (by 10 percent) transition rates than similarly resourced schools that did not have at least 25 percent unqualified teachers.

In the investment model, higher per student teacher spending[4] was positively correlated with school-level Grade 4 and Grade 7 survival rates and with higher percentages of pupils achieving credit, merit, or distinction on Grade 7 English exams. Higher district school-level mean spending per student on teachers was also associated with higher percentages of pupils in a district scoring credit, merit, or distinction on Grade 7 and Grade 9 English exams.

Policy recommendation: Improve the equity of teacher allocation across schools comprehensively (quality and quantity), rather than only student-teacher ratios.

M&E: Track over time the equity in teacher allocation across schools using an index that incorporates quality rather than reliance on ratios (the investment model used in this analysis is an example of a measure that captures both the number and quality of teachers in a school).

EARLY EDUCATION

Schools that had a preschool on the premises and where **preschool enrollments** of four-year-old and five-year-old children were at least 50 percent of Grade 1 enrollment also had Grade 4 survival rates about 15 percent higher than similarly resourced schools with no preschool or a preschool that was smaller relative to Grade 1 enrollment.

While having a preschool on premises may be a very imprecise indicator of whether children in the primary grades were likely to have attended preschool, it is the best we have in the existing data. Having a preschool on premises may also be associated with other factors that independently affect how likely pupils from a community are to persist in their schooling. Regardless, controlling for other school characteristics, having a preschool on premises is associated with higher survival rates to Grade 4.

[4] The higher spending per student on teachers is a function of differences in teacher quality (qualifications and experience) as well as the number of teachers relative to the number of students.

Policy recommendation: Expand access to quality public preschool education, particularly in areas where private provision is scarce.

M&E: Track over time the ratio of preschool enrollment to Grade 1 enrollment by the relevant geographical region (zone, ward) within the district.

SCHOOL FACILITIES

Schools where **toilets** are available at a ratio of one toilet per 50 pupils or lower have higher survival rates to Grades 4 and 7 (10-15 percent higher) than similarly resourced schools with lower provision of toilets (more than 50 pupils per toilet). While differences in survival rates between schools with 50 pupils per toilet and school without toilets or toilets provided at greater than 50 pupils per toilet were statistically significant, the threshold level (50 to 1) was chosen arbitrarily and should not be interpreted as an empirically derived threshold for impact on survival rates. The relationship between accessibility of toilets and survival rates did not appear to differ by gender.

Policy recommendation: pupils in schools with adequate provision of toilets have higher survival rates.

M&E: Track the percentage of school enrollment with access to adequate toilets at an appropriate threshold rate.

GENDER

The percentage of girls enrolled in a school did not have a statistically significant relationship with school-level Grade 4 or Grade 7 survival rates. This is consistent with the aggregate estimation of survival rates to Grades 4 and 7, which were similar for boys and girls.

While girls are slightly less likely than boys to enter Grade 9 (see Table 1 on page 18), districts where a higher percentage of girls reach Grade 7 are also more likely to have a higher percentage girls transition to Grade 8.

Pregnancy rates in a school (number of reported pregnancies/female enrollment) had a statistically significant relationship with survival rates to Grade 4 and to Grade 7. However, the effect was quite small: a school with twice the pregnancy rate of a similar school would be expected to have survival rates that were just one percent lower. The pregnancy rate of Grade 7 girls in a district did not have a statistically significant association with district-level Grade 7 to Grade 8 transition. However, it is important to interpret this finding cautiously. Early pregnancy can have a devastating impact on a girl's life. For this reason, efforts to address the issues of pregnancy and early marriage are imperative. The interpretation is not that pregnancy does not affect a girls' decision about schooling; only that the numbers of girls affected by pregnancy are very small relative to the entire population of girls enrolled in school.

The attention to pregnancy has resulted in a formal government policy on facilitating the re-entry of girls who have left school due to pregnancy.[5] Additions to the data collection instruments in the sector have been implemented to track both pregnancy and re-entry. In surveys and field visits, decision makers indicated that practical implementation of re-entry policies could vary significantly from place to place and that the new data systems and capacity for analysis would need to be strengthened before the re-entry policy could be effectively monitored.

Policy recommendation: Through much of education system girls are nearly as likely to persist in school and have relative parity in learning outcomes with boys. Many factors other than gender — like poverty and geographical differences in opportunities for education — play an important role in determining the amount of school an individual boy or girl is able to complete and their learning outcomes. However, gender remains an important equity concern because the consequences of low levels of education are likely more serious for girls than boys in terms of reproductive health choices, HIV/AIDS, and poverty. In particular, the consequences of early pregnancy and/or early marriage can be serious, life-long, and transmitted across generations.

M&E: Track equity more broadly, beyond an exclusive focus on gender.
Track and report spending on gender equity initiatives annually. Formally evaluate (external) at least one district gender equity initiative per year and report to provincial and national officials.
Implement periodic standardized sample-based monitoring of the re-entry policy (formal random sample of girls identified as beneficiaries of the re-entry policy).

SUPPLEMENTAL SUPPORT FOR STUDENTS

Direct support to pupils in the form of **bursaries** are provided by the Government of the Republic of Zambia (GRZ) and private/NGO sources.[6] There was no statistically significant association between bursaries provided in schools at the primary level and survival rates to Grade 4 or Grade 7. There was also no statistically significant relationship between the percentage of pupils receiving a bursary at Grade 8 in a district and the district transition rate from Grade 7 to Grade 8.

In 2014, schools reported that 49,283 bursaries were provided to children enrolled at the primary level, about 65 percent from private sources. About 30 percent of the schools in the analysis of survival rates to Grade 4 and Grade 7 reported having bursaries from either government or non-government sources. For Grades 8 and 9, about 24,042 bursaries were provided with 70 percent of the bursaries from private/NGO sources.

It is difficult to assess the underlying effectiveness of bursaries as currently managed using the existing education data. The results do suggest that targeting of support

[5] The policy also makes provisions for engaging with pregnant girls who are attending school to facilitate their absence for delivery and re-entry into the school.
[6] Bursaries generally cover the cost of school uniforms, shoes, books, and school supplies.

could be improved. Orphans are the target for many of the bursary schemes. If bursaries from all sources provided to basic education pupils were perfectly allocated to children who had lost both parents, the number of bursaries reported would have been sufficient to provide assistance to about 30 percent of those children.

For Grade 8 only, schools reported 10,189 bursaries being provided to pupils (60 percent to girls), or an amount sufficient to provide a bursary to about 80 percent of the pupils enrolled in Grade 8 who had lost both parents (or 20 percent of those who had lost at least one parent). However, about 65 percent of the schools that report at least one child in Grade 8 as a double orphan did not report receiving any bursary support. With so few bursaries provided relative to the number of orphans and the low correlation between the number of bursaries provided in a school and the number of orphans in the school, even bursaries that were very effective on an individual level may have very inefficient results (high costs of bursaries relative to improvements in system outcomes/indicators).

The lack of a statically significant relationship between bursaries provided and Grade 4 and Grade 7 survival rates at the primary level and transition rates to post-primary education (Grade 7 to Grade 8) at the district level should not be interpreted as evidence that bursaries do not improve persistence in school for a bursary recipient. Evaluating the effectiveness of the bursary schemes in promoting higher levels of attainment requires individual-level student data and a carefully constructed sample. Individual student-level analysis would provide insights into the relationship between bursary provision and the likelihood of remaining in school, how bursary provision impacts different types of pupils (gender, age, level of poverty, etc.), and the impact of the amount and type of bursary on the likelihood of pupils remaining in school.

Interviews and surveys results from district and provincial decision makers highlighted the provision of additional boarding places as priorities for improving results. School differences in the ratio of boarding places to enrollment was not associated with differences in school survival rates to Grade 4. There was a statistically significant association between boarding places and Grade 7 survival rates but the substantive impact was very small. There was no statistically significant association between the ratio of boarding places and Grade 8 enrollment in a district and the district transition from Grade 7 to Grade 8. As is the case with the assessment of the equity impact of bursaries, the impact of the provision of a boarding place on the persistence in school can only be assessed with individual-level data that enables a reasonable estimation of how the provision of a boarding place affects the likelihood of remaining in school.

Policy recommendation: Direct support to pupils and households for the most vulnerable promotes equity and improves overall results. However, little is known about the effectiveness of bursary schemes and existing schemes may not be efficiently targeted to the most vulnerable. Unless schemes are effective and reasonably well targeted, they represent a loss of efficiency in the system (significant costs for little or no improvement in outcomes). The same concerns apply to the provision of boarding places.

M&E: a) Undertake studies on bursary schemes and boarding provision to determine their effectiveness in promoting higher levels of education attainment.
b) Strengthen (and potentially revise) targeting protocols for allocation of direct support to pupils based on the study of bursary schemes and boarding places, and incorporate regular monitoring of allocation and performance of recipients.

COMPREHENSIVE EQUITY IN SCHOOL RESOURCES

In addition to estimating the relationship between individual school characteristics and student outcomes, an investment model was also constructed capturing the annualized monetary equivalent of all resources available to a student in a school. While analysis of annual budgets may describe how spending in the current year was distributed among schools and students,[7] the resources that support instruction in classrooms represent a mix of spending in the current year — such as teacher salaries — and long-term capital spending on infrastructure, equipment, and materials. The investment model provides a comprehensive estimate of the resources available to pupils in a given year and school converted to a monetary figure. While this figure is referred to as "spending" in this analysis (as shorthand), a more accurate description is the estimate of the annualized resources consumed or invested per year per student in each school.

This model was constructed by converting the physical and human inputs detailed in the school census data into three types of spending estimates: infrastructure/materials, teachers, and supplemental support for students. An annual per student spending for infrastructure and materials was estimated by converting the classrooms, furniture, student books (text and library books), teacher books, and classroom equipment (computers, radios, televisions) into an annualized equivalent monetary amount using standard financial methods for discounting capital costs. This annualized figure was divided by the number of pupils in the school to yield the estimate of per student annual spending on infrastructure and materials. The replacement costs (for example, the cost of a classroom) for the calculations were taken from the MOGE procurement standards where possible.

Spending per student (estimated using the investment model) was analyzed in relationship to Examination Council of Zambia (ECZ) exam results in English and mathematics for Grade 7 and Grade 9. Individual exam scores were converted into a classification of the student's results into two categories: (1) having achieved credit, merit, or distinction or (2) having a lower classification of results.

It was possible to match ECZ exam center results in English and mathematics for Grade 7 to about 2,200 schools. Spending per student on teachers and infrastructure in these schools was positively correlated with the percentage of examines who achieved credit, merit, or distinction. While correlation was relatively weak, **there**

[7] The examination of annual budgetary information frequently provides little insight into how even short-term spending is distributed among students and schools.

was a statistically significant relationship between higher levels of resources per student and better learning outcomes.

For Grade 9 ECZ exam results, it is not possible to link testing centers reliably to individual schools. Instead, district-level percentages of examinees achieving credit, merit, or distinction were analyzed in relation to mean district levels of spending per student from the investment model. As was the case for Grade 7 exam results, higher levels of spending per student on teachers and infrastructure was associated with higher percentages of pupils achieving credit, merit, or distinction on Grade 9 examinations in English and mathematics.

The investment model was also used to examine resource allocation and survival rates to Grades 4 and 7. School resources per student for each category had a statistically significant correlation with Grade 4 and Grade 7 survival rates. Per student spending on teachers was more closely correlated with survival rates than spending on infrastructure or materials or supplemental spending.

The relationship between resources and survival rates is more pronounced when evaluated at the extremes of the distribution. Schools in the bottom 20 percent of total available resources per student have Grade 4 survival rates about 36 percentage points lower than schools not in this group of schools (50 percent Grade 4 survival rate versus 86 percent survival rate). The 20 percent poorest resource schools had Grade 7 survival rates about 7 percentage points lower (67 percent versus 74 percent) than other schools.

Policy recommendation: While a positive relationship between resources and learning outcomes is unlikely to surprise many decision makers, it is often difficult for managers to comprehensively assess and monitor how resources are distributed across schools. In the proposed benchmarks included in Annex 5, the investment model used in the analysis is applied to all schools and profiles are created for each district that enable decision makers to examine differences in resource endowments across districts and also to examine relative inequality across schools within each district.

M&E: Develop and track indicators that comprehensively measure school-level resources and inequality in school-level endowments.

SECTION 1

INTRODUCTION

PURPOSE AND OBJECTIVES

STEP-Up Zambia is a USAID-funded five-year (2012-2016) initiative providing technical assistance to the Ministry of General Education (MOGE) to strengthen capacity of staff at the central, provincial, district, and schools levels and to transform organizational/institutional cultures toward a focus on learning achievement as an education management tool. STEP-Up interventions are designed to contribute to the attainment of the USAID/Zambia Development Objective: Human Capital Improved (Development Objective 3). STEP-Up support is organized in five key task areas:

1. Integrate and strengthen systems for improved decision-making.
2. Promote equity as a central theme in policy development and education management reform.
3. Institutionalize MOGE's management of HIV/AIDS workplace programs.
4. Strengthen decentralization for improved learner performance.
5. Engage Zambian institutions of higher education in MOGE policy research and analysis

This purpose of this document is to describe potential approaches for enhancing planning and monitoring to improve equity in the Zambian education system. This work contributes to STEP-Up Zambia Task Areas 1 and 2. The specific objectives for this document are to:

- Assess equity in the current delivery of education in terms of outcomes and investments.
- Analyze the distribution of education investments and education outcomes, identifying key relationships between investment and outcomes.
- Elaborate draft benchmarks/indicators for monitoring progress on equity at the national, provincial, and district levels (with focus on the district level) using existing education-sector data sources.
- Develop recommendations for priority actions for improving equity in the system.

Strengthening systems for decision making at the subnational level is a strategic focus of STEP-Up Zambia. The emphasis in this analysis of equity is on providing an actionable framework to strengthen systems for planning and decision making at the district level.

DATA SOURCES, METHODOLOGY AND LIMITATIONS

The objective of this equity assessment is to suggest potential benchmarks for planning and monitoring for equity that can be generated from the existing education-sector data. The two data sources analyzed are the MOGE's EMIS data and the Examinations Council of Zambia exam results. Both of these data sources

are compiled annually and are typically used to monitor and report aggregate results like enrollments, pass rates, completion rates, and exam scores. In this document, the same data sources are used to examine how selected education outcomes[8] vary and the relationship between differences in outcomes and the characteristics of schools.

While extending the use of the existing data sources to support decision makers in improving equity offers the benefit of not requiring collection of additional information, there are also important limitations. Many factors that impact how much schooling a child completes or her/his level of achievement are not captured in the existing education-sector data on schools, and therefore limit the utility of this data in planning and monitoring for equity. Two are described below.

- *Limitations on identifying pupil -level causes*. The education-sector data is aggregated at the level of schools and classes, not individual pupils. While it may be possible to identify relationships between better or poorer outcomes and the characteristics of schools (ratio of pupils to teachers, available materials, region, etc.), there is always some potential for ecological fallacies of interpolating individual results from these relationships. For example, knowing that very low-PTR schools have lower survival rates than schools of a more typical size does not in itself explain why children in those schools are more likely to drop out.

- *Greater visibility of data-entry errors*. A final limitation is that the reliability of the analysis is affected by the accuracy of the underlying data. When education-sector data is used to report results at the national (9000+ schools) or regional level (500+), reporting or data-entry errors in a few schools do not materially impact results. However, when the purpose of the analysis is to examine how outcomes and school characteristics differ across schools, these errors become visible.[9]

Nevertheless, while associations in the existing data between school characteristics and student outcomes may not identify exactly what causes poorer results or provide policy makers with a specific, immediate response, they can identify problem areas for improving equity. For example, knowing that schools with very few qualified teachers or schools with higher percentages of children overage for their grade are associated with lower survival rates than other schools is potentially useful information for allocating resources in a manner that improves equity.

ORGANIZATION OF THE DOCUMENT

The document begins with a brief exploration of equity in education (Section 2: Education Equity). This section presents the case for equity as a policy imperative and describes frameworks and methodologies for assessing equity in an education system, including how equity is currently conceptualized and monitored in Zambia.

In the next section (Section 3: Mapping equity in education in Zambia), these alternative methods and frameworks are applied to describing the equity/inequity in

[8] Outcomes used in the analysis are survival rates and exam results in mathematics and English.
[9] These are not new errors, they are merely not apparent when presented in national or regional aggregates.

the Zambian system. Equity is assessed in terms of how outcomes and key investments are distributed among pupils and schools.

The mapping of the distribution of outcomes and investments is followed by an analysis of the relationships between outcomes, student/school/community characteristics and the distribution of education investments in Zambia (Section 4: Equity and investment). This analysis provides guidance for identifying potential strategic and operational indicators for a framework for enhancing subnational planning and monitoring for equity.

Finally, in Section 5: Summary and recommendations, the paper summarizes the results of the equity analysis and presents a draft framework for planning and monitoring to improve equity (Annex 5) as well as identifying potential interventions to increase equity in the system.

SECTION 2

EDUCATION EQUITY

EQUITY AS A POLICY IMPERATIVE

Equity is concerned with the principles of fairness and rights. Efforts to improve equity in results — by closing the gaps in health, education, social protection, and other support for marginalized groups — nearly always entail greater complexity in delivery and increased costs over business as usual.[10] While rights and fairness are prioritized in international norms and conventions as well as many national policies, policy development and budgeting often involves political and fiscal balancing of the "costs" of improving fairness against competing notions of efficiency.

Experience in many sectors over the last 25 years has resulted in an increased recognition that a focus on equity may, in many, cases also improve efficiency.[11] Large-scale expansion of access to health, education, and social protection have produced significant improvements in global and national human development indicators. Global under-five mortality rates fell by one-third between 1990 and 2009.[12] The percentage of children out of school in developing countries declined from 20 percent in 1999 to 12 percent by 2010 – with low-income countries making even more impressive gains by halving the percentage of out-of-school children from just over 40 percent to 20 percent.[13]

While the impact of expanded services is significant, many children have been left out and, in too many cases, the gap in outcomes between children in favorable and less favorable circumstances has widened. In a number of measures of child survival and progress toward Millennium Development Goals (MDGs), many of the poorest countries have fallen further behind other developing countries despite their improving results. The experience of increasing inequity despite positive national trends is also reflected within countries. In a UNICEF study of 26 countries where under-five mortality rates had declined by 10 percent or more since 1990, 18 of the countries also experienced a growing gap in mortality rates between children in the richest 20 percent of households and children in poorest 20 percent of households.[14] In an analysis of educational attainment in 33 low income countries, UNICEF found that attainment for the most disadvantaged group[15] was three years or less with differences in average attainment between the most disadvantaged group and the least disadvantaged group frequently in excess of eight or nine years. Completion rates for basic education for 28 developing countries with comparable data averaged about 50 percent for children from the poorest 20 percent of households, while

[10] "Business as usual" is meant as continuing or even increasing public investment without changing its structure and without targeting for equity.
[11] While improving results for marginalized groups has always been recognized as a potential means of improving the overall efficiency of public investment, policy debates are now more likely to incorporate efficiency arguments in support of equity-enhancing policies.
[12] United Nations Children's Fund, 2010.
[13] EFA Global Monitoring Report, 2012.
[14] United Nations Children's Fund, 2010.
[15] The most relevant disadvantages can look different across countries: gender, geographical location, special needs, linguistic and cultural minority status, and others.

rates for the richest 20 percent were 95 percent or greater in 12 of the countries and greater than 80 percent in 21 of the 28 counties. These types of gaps are reflected within countries across a broad array of measures, including access to pre-primary schooling, transition to lower and upper secondary, and learning outcomes.[16]

In formal assessments of learning outcomes in southern and eastern Africa differences in mean reading scores between pupils in the highest and lowest wealth quintiles more than doubled from 37 points in 2000 to 87 points in 2005.[17] While differences in student reading scores between the highest and lowest wealth quintiles in Zambia are smaller, these too increased significantly from a 10 point difference in 2000 to a 32 point difference in 2005 and continued to expand with the difference reaching 64 points in 2007.[18] An examination of primary education completion rates using a cohort analysis of young adults indicates that primary completion rates in Zambia fell across the entire wealth distribution between 1996 and 2007. However, the decline in completion rates was much greater among the extremely poor. Gender differences narrowed for the non-poor during the same time period but remained large and virtually unchanged for the extremely poor.[19]

This persistence — and in some cases the growth — of inequity in a period of expanding health, education, and social protection systems and improving national indicators has changed the calculus for considering equity as a public policy imperative. Because excluded populations typically have more children, higher fertility rates, higher percentages of children that die from preventable diseases and have less access to cost-effective interventions, child survival policy and investments that incorporate an equitable focus can accelerate progress to child survival MDGs and be considerably more cost-effective than business-as-usual expansion that does not explicitly target equity.[20] In education, a number of policies for improving participation and persistence in school typically have a relatively larger impact for disadvantaged children. For example, cash transfers, elimination of school fees, provision of free school supplies, school feeding, etc., address financial barriers more likely to affect poor children than the non-poor. As marginalized groups start from a lower base,[21] new investments that improve results are likely to have a greater relative impact on disadvantaged children and reviews of impact studies indicate that the size of the impact of an intervention is correlated with the size of the gap it is designed to address: the larger the gap the larger the impact.[22] This positive relationship between disadvantage and potential impact suggests that a well-designed equity focus in education can in many cases simultaneously improve fairness, overall results, and efficiency.

MEASURING EQUITY

The case for equity as a policy focus that can improve fairness as well as overall results was briefly presented above. To embed this focus into decision making requires identifying useful benchmarks that can guide planning and measure progress.

[16] UNICEF, 2015.
[17] Southern and Eastern Africa Consortium for Monitoring Educational Quality, n.d.
[18] Southern and Eastern Africa Consortium for Monitoring Educational Quality, n.d.
[19] United Nations, 2013.
[20] UNICEF, 2010.
[21] For example, lower entry rates, lower completion rates, lower learning outcomes.
[22] UNICEF, not dated.

The objective of a policy focus on equity is to improve outcomes. While children differ in innate capacity to succeed in school, a policy focus on equity enables more children to reach their capacity through strategies and investments that weaken the role that disadvantages and barriers play in determining success. Developing useful benchmarks for improving equity in Zambia draws on standards and best practices from international experience and the identification of important relationships between outcomes, disadvantages, and resources in the Zambian system.

In developing the framework for assessing equity, two outcome measures were used: (1) persistence in school as measured by estimated survival rates to Grades 4, 7, 9, and 12, and (2) learning outcomes in mathematics and English at Grades 7, 9, and 12. Survival rates are calculated on the basis of grade-to-grade transition and dropouts, and provide an estimate of the probability that a child entering Grade 1 today will complete a given level of education based on the current system performance. Survival rates were estimated at various levels (school, zone, district, etc.) using a cohort method and 2012-13 and 2013-14 EMIS data provided by MOGE. Learning outcomes were provided by the ECZ in the form of a summary of individual-level results in English and mathematics by ECZ testing center.

Understanding and improving equity in the education system is not possible without a picture of how outcomes are distributed. National, provincial, and district aggregate indicators provide a means of monitoring trends in the education system over time, but they do not provide actionable information for improving equity. Provinces and districts with nearly identical outcome averages may have very different distributions of outcomes. Having information about how outcomes differ within a district supports decision makers to prioritize actions and investment where they are likely to have the largest impact on improving equity as well as overall district outcomes.

Suitable infrastructure, appropriate materials, and the numbers/quality of teachers have an impact on all children's outcomes. Lack of adequate access to these resources constitutes one type of barrier or disadvantage for many children. Barriers to success are not distributed equally among all children, and efforts to help children overcome these barriers often require an unequal distribution of resources and support. For some children, overcoming barriers to successful outcomes requires additional support in terms of material assistance (scholarships, school feeding, boarding and special programs). As is the case with outcomes, the most relevant information for promoting equity is how access to these resources is distributed across children, schools and communities.

EQUITY IN POLICY PRIORITIES IN ZAMBIA

The guiding documents for education policy in Zambia include the 1996 policy document, *Educating Our Future* and the National Implementation Framework III: 2011-2015 (NIF, which operationalizes the implementation of the Sixth National Development Plan). The SNDP identifies goals, objectives, and strategies for each

level of the education system: ECE through tertiary. Equity features in the goals and objectives for each level as well as being the subject of a chapter of the NIF.[23]

> **The overall objective of the Ministry of Education equity strategy is to promote fairness and inclusion by creating conditions that equalize learning opportunities for all. The NIF's approach ensures coherence in the implementation of equity policies and strategies. It also aims to increase equity in the allocation and utilization of educational resources. This NIF addresses equity through the components of gender, orphans and vulnerable children (OVC), community schools, adult literacy, Special Educational Needs (SEN), HIV and AIDS, and school health and nutrition (SHN).**
>
> **— NATIONAL IMPLEMENTATION FRAMEWORK III PG. 48**
>
> **Equity considerations in the provision of universal education at all levels shall be the cornerstone of the Ministry of Education approach at this level, paying special attention to the peculiar needs and requirements of the girl-child, OVC, Learners with Special Education Needs (LSEN) and those that are affected by, and infected with, HIV and AIDS.**
>
> **— NATIONAL IMPLEMENTATION FRAMEWORK III PG. 48**

An important characteristic of the approach to enhancing equity in Zambia has been the focus on groups identified as marginalized: girls, OVCs and children with special education needs (CSEN). Support for these groups has included work with communities in sensitizing them to the rights of children, training for teachers and managers, expansion of facilities for incorporating children with special needs at all levels, and material and financial support for children impacted by HIV/AIDS (OVCs) and for girls.

MOGE guidelines for Provincial and District Strategic Plans are organized by 13 themes, including equity and inclusiveness. Budget proposals for the plans incorporate a benchmark of 15 percent for equity activities. In addition, MOGE provides funds for bursaries at both primary and secondary level.[24] Among the criteria for administering government-supported bursaries is that more than 50 percent of recipients should be girls.

In the last few years, the plight of girls who leave school because of pregnancy or early marriage has drawn considerable attention from stakeholders. As a response, MOGE has implemented a policy to facilitate the re-entry of girls who leave school because of pregnancy. In addition, information systems were strengthened to incorporate tracking of pregnancy and the implementation of the re-entry policy.

[23] Zambia Ministry of Education, 2010.
[24] Private entities (NGOs, foundations, charities) also provide bursaries and material support.

SECTION 3

MAPPING EQUITY IN EDUCATION IN ZAMBIA

EDUCATIONAL ATTAINMENT

The goal of an education system is to enhance individual capacity for participation in social, cultural, and economic life. There is an important relationship between the level of schooling an individual attains and the development of capacity for participation in these various areas. One measure of the performance of the system in promoting educational attainment is pupils' survival rate.

The 2014 Zambia Education Statistical Bulletin presents a national (aggregate[25]) survival rate to Grade 5 of about 70.7 percent and a survival rate to Grade 9 of 57.9 percent. In both cases, the rates for boys were slightly better than the rates for girls. Survival rates for Grade 5 and Grade 9 by province vary from less than 80 percent to more than 150 percent for Grade 5, and from about 36 percent to more than 132 percent[26] for Grade 9.[27]

While national and provincial survival rates provide a means of monitoring the education system over time, these aggregate rates may obscure important differences in outcomes across schools and communities.[28] Understanding these differences is important for targeting investments to promote equity and to cost-effectively improve system outcomes.

In order to incorporate information about how schools and communities differ in their success in retaining children in school, school-level survival rates were estimated using data from the 2012-13 and 2013-14 school census. Survival rates were estimated for Grade 4, the final grade of primary school (Grade 7), the final grade of basic education (Grade 9), and the final year of secondary schooling (Grade 12).

Table 1 presents estimated survival rates to Grades 4, 7, 9, and 12. These national aggregate rates are calculated on the basis of total enrollment by grade in 2012-13 and 2013-2014. Aggregate rates are not calculated by school and do not represent the national average across schools but

Table 1: National Aggregate Survival Rates

Survival Rates 2014			
	Boys	Girls	Total
To Grade 4	89%	88%	89%
To Grade 7	69%	64%	67%
To Grade 9	48%	45%	47%
To Grade 12	30%	27%	29%

[25] The survival rates presented in the Education Statistical Bulletin are aggregate rates. These aggregate rates are calculated using total grade enrollments for the country or province rather than school-level averages.

[26] Survival rates of greater than 100 percent at the subnational level can result from the geographical migration of students and from errors in both school-level reporting and the number of schools reporting in a particular area.

[27] This information is presented in Tables 60 and 61 of the 2013-2014 Education Statistical Bulletin.

[28] Distributions with identical means and standard deviations can look quite different when the shape of the distribution within districts is visualized.

rather the performance of the system without consideration of how rates differ across schools and communities. These national aggregate results suggest that the likelihood of girls and boys persisting to Grade 4 is very similar. The aggregate results also indicate that girls are less likely than boys to persist through 7, 9, or 12 years of schooling. While these gender differences have important implications, the most striking feature of the aggregate results is that 30 percent of pupils who enter Grade 1 are missing by Grade 7 and 70 percent by Grade 12 and that the differences across schools are of much greater magnitude than the differences in mean survival rates for girls and boys.

Table 2: Interquartile Range for Survival Rates

Survival Rates 2014		
Interquartile (by school); Middle 50%		
	Boys	Girls
To Grade 4	51-124%	50-124%
To Grade 7	32-116%	26-110%
To Grade 9*	23-82%	20-70%
To Grade 12*	9-92%	8-70%

*estimated for zones

To illustrate the level of variability in survival rates across schools, Table 2 presents the interquartile range for school-level estimates to Grades 4 and 7. The interquartile range is the lower and upper boundary that captures the middle 50 percent of school-level survival rates. While the aggregate national survival rate to Grade 4 is nearly 90 percent, the range in rates by schools for the middle 50 percent of schools is between about 50 and 125 percent[29] with little difference between school-level rates for boys and girls. Not surprisingly, the range of the middle 50 percent of school-level Grade 7 survival rates is wider than the range for Grade 4. School-level rates were not presented for Grade 9 and 12 as persistence in school to those grades usually requires transitioning to a school that offers those grades. To capture the degree of variation in survival rates at those levels, rates were estimated by education zones[30] captured in the MOGE's EMIS system. As was the case with school-level estimates for Grades 4 and 7, there is considerable variation in survival rates to Grade 9 and 12 with rates somewhat lower for girls.

Tables 3 and 4 (pages 20-21) present the distribution of estimated school-level survival rates to Grade 4 and Grade 7 by districts. To make this presentation of school-level survival rates manageable, schools with results that were likely the result of reporting errors, data-capture errors, or large changes in the size of school due to migration or closing/opening of new schools nearby, etc., were removed. This was accomplished by omitting the lowest and highest 5 percent of estimated school-level survival rates.

The gray shaded boxes for each district capture the range in survival rates for the middle 50 percent of schools in that district. The blue horizontal line within each of

[29] Survival rates of greater than 100 percent at the school level are due to reporting errors in the annual census, data-entry errors, or changes in the school population due to new schools opening or schools closing in the area. These inconsistencies and errors create "outliers" in the data that are not apparent when the data is used to calculate national, provincial, or district summaries. As these errors are assumed to be random, they are unlikely to bias the analysis.

[30] Zones are the lowest administrative structure in the education system. The number of zones within a district varies from 1 to 25 with the average being 10 zones in a district. In 2013-14, schools were linked to about 860 zones.

Table 2. Distribution of School-Level Grade 4 Survival Rates

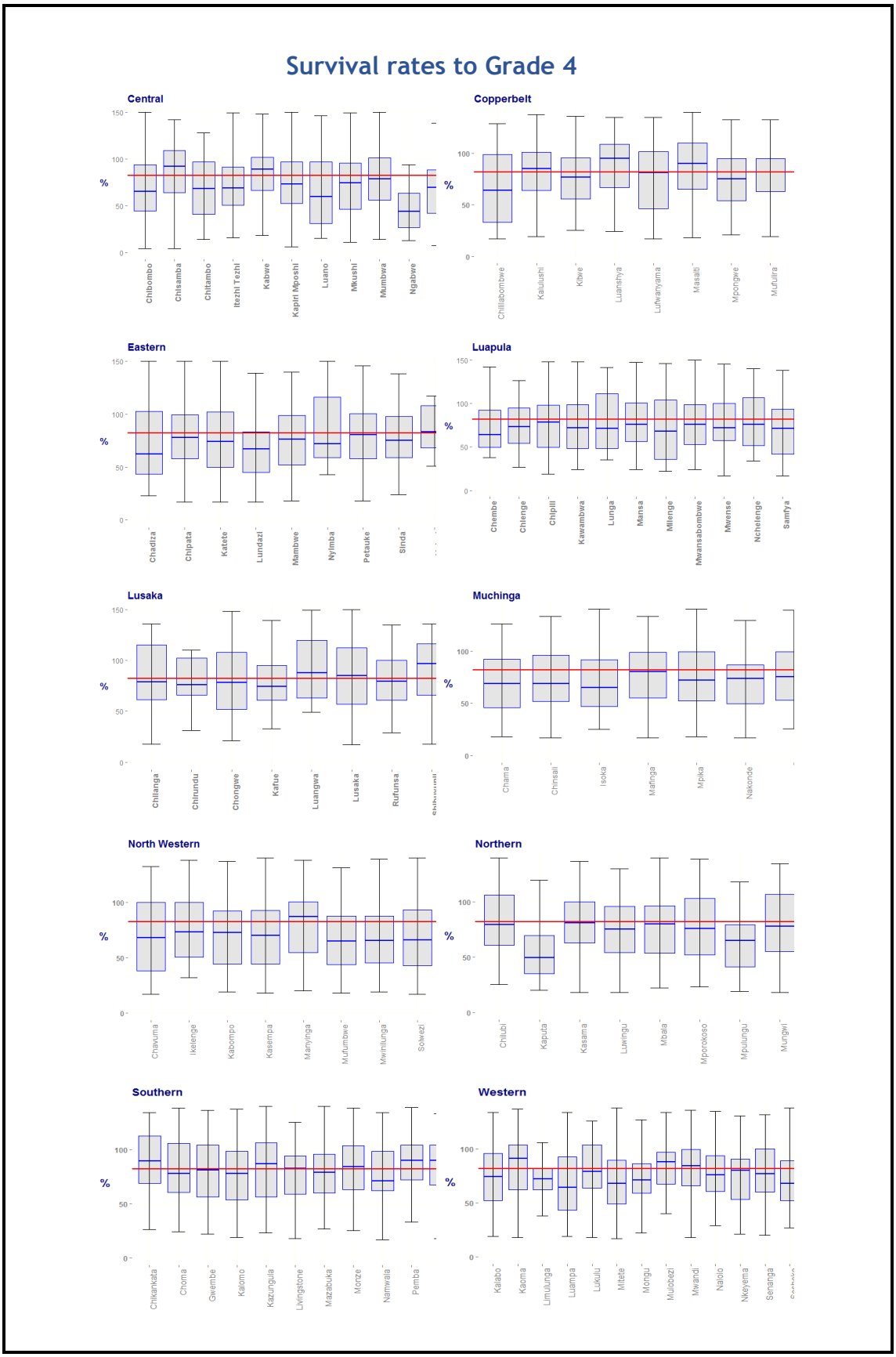
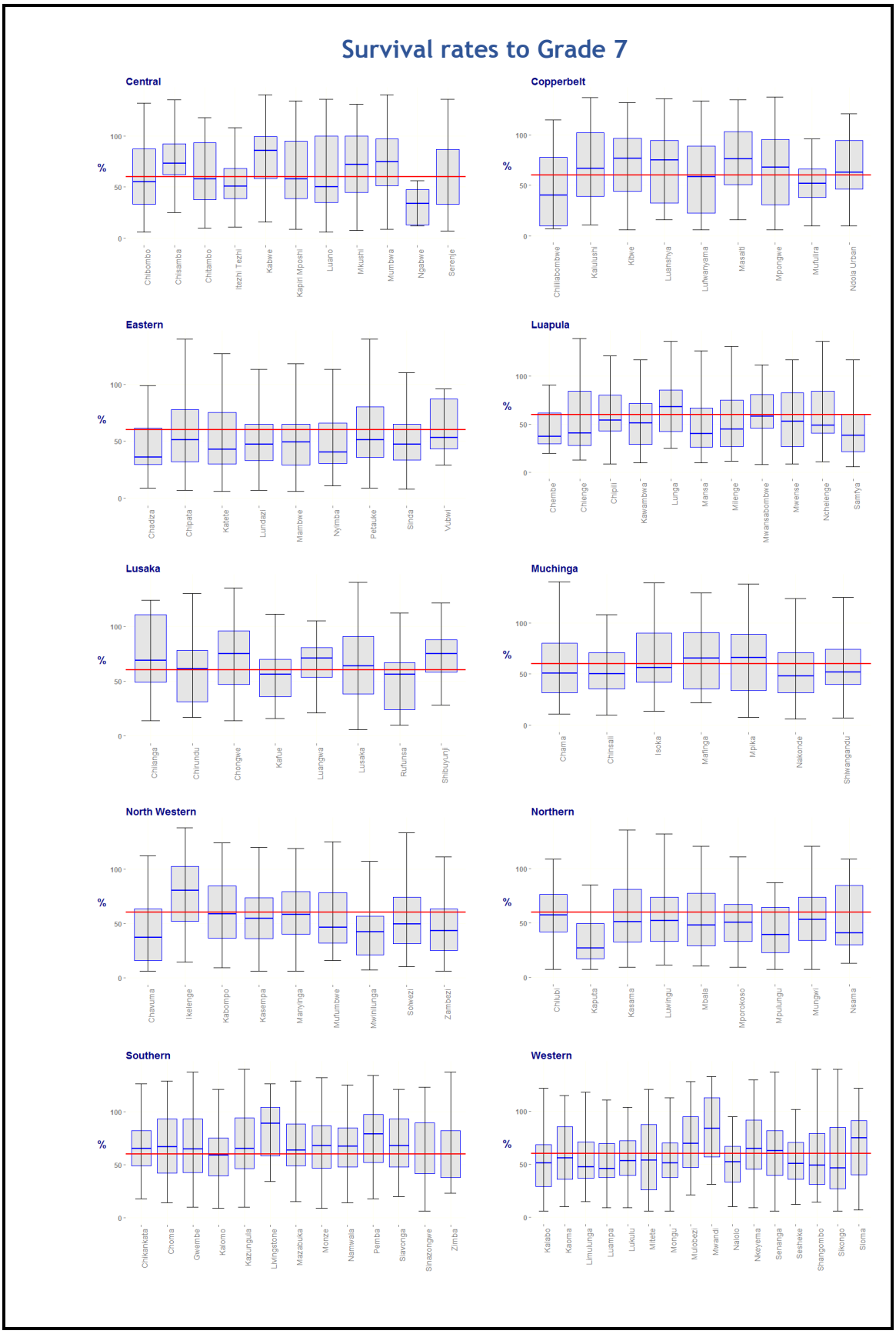


Table 3: Distribution of School-Level Grade 7 Survival Rates



the shaded boxes represents the median school-level survival rate for the district, and the grey lines that extend above and below the shaded boxes indicate the range of 95 percent of the schools in the district. The horizontal red line in each table designates the median survival rate of all schools in Zambia; 82 percent for Grade 4 and 61 percent for Grade 7.

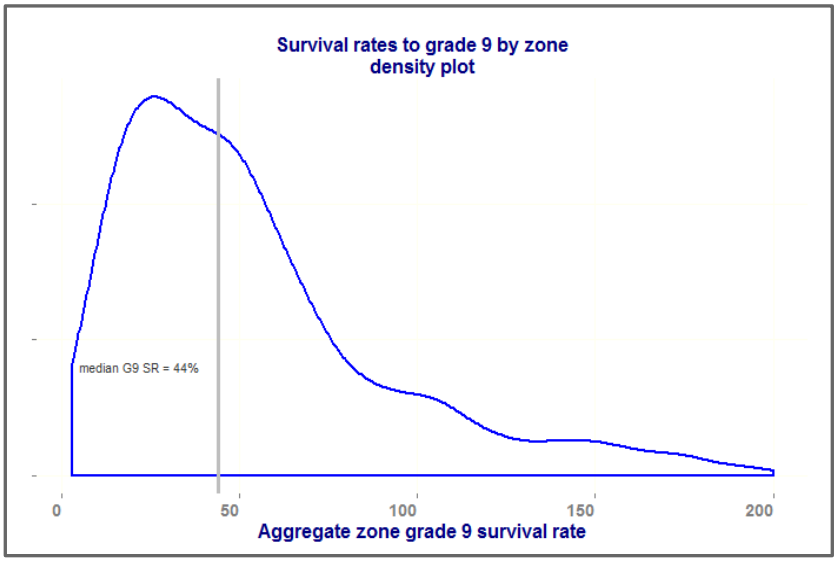
Tables 3 and 4 provide insight into the underlying variation of estimated survival rates at the school level not captured in the aggregate provincial and district rates. A cursory examination of Tables 3 and 4 indicates that the differences among districts within provinces are greater in some provinces than others. For example, the distribution of school-level Grade 4 survival rates are more similar across the districts in North-Western Province than the distribution of rates across the districts in Northern Province. There are also a number of districts that are outliers — either high or low — compared the other districts in the province: for example, Ngabwe District in Central Province and Kaputa District in Northern Province for both Grade 4 and Grade 7 survival rates.

Alongside the variation in estimated survival among schools within districts, there is also variation across districts in a province. In Central Province, for example, the gray area indicating the range of Grade 7 survival rates (Table 4) for the middle 50 percent of district schools is much wider in Chimbomo District than in Itezhi Tezhi District. Similar differences in school-level rates across districts are observable to some degree in all of the provinces. Finally, Tables 3 and 4 indicate how schools in each district compare to the national median survival rates. For example, the median estimated survival rates for schools in each district in Lusaka Province are at or above the national median rates (red line), while almost all of the median rates for schools in each district in Luapula Province are below the national median rates.

Province/district tables like Tables 3 and 4 are not presented for Grade 9 and 12. As many fewer schools offer Grades 9 and 12, and pupils must transfer to these schools if they wish to continue their education, survival rates cannot be calculated at the school level.

About 80 percent of education zones offer Grades 8 and 9 in at least one school. Figure 1 presents the distribution of survival rates to Grade 9 calculated by aggregating all school enrollment in a zone. Across the 800 plus zones, one-half have rates less than 44 percent (median) and one half have

Figure 1. Grade 9 Survival Rates at Zone Level



rates above 44 percent. This zone-level description is not possible for Grade 12 survival rates as only 26 to 30 percent of the more than 800 zones in the education system offer Grade 12.

LEARNING OUTCOMES

The distribution of learning outcomes was analyzed using individual-level Grade 7 and Grade 9 national exam results in English and mathematics provided by the examination council of Zambia (ECZ). ECZ testing centers exist primarily in schools, but also in other education and training institutions. While examination data was provided at the level of individual students, the system does not currently provide an individual identifier that links examinees to the schools they attend. The identifying codes for testing centers are not the same as the EMIS codes for schools making establishing a direct link between examinees and the schools they attend problematic. Testing center information provided by ECZ did include the district where the testing center was located.[31]

Aggregate exam results tracked over time do provide policy makers a means to assess system performance. However, they do not currently provide information about how differences in school characteristics (physical resources, teachers, etc.) or student characteristics (household composition, poverty, etc.) affect learning outcomes.

Table 5 (next page) summarizes the distribution of 2014 individual test results for Grades 7 and 9 in English and mathematics at the district level. For Grades 7 and 9, the table summarizes the percentage of district pupils who sat for the exam[32] and the percentage of all examinees who achieved a score of credit, merit, or distinction.[33] For example, the percentage of Grade 7 pupils sitting for the Grade 7 English exam in districts ranged from 51 percent (the lowest) to 179 percent with middle 50 percent of the districts falling between 85 percent and 98 percent. The percentage of all Grade 7 examinees in a district scoring credit, merit, or distinction in the English exam ranged from a low of 31 percent to a high of 74 percent of a district's pupils sitting for the English exam. The middle range (the middle 50 percent of the districts) had a percentage of examinees scoring credit, merit, or distinction between 40 and 57 percent of all those sitting for the Grade 7 English exam. Table 5 illustrates that there is significant variance across the 102 districts on aggregate performance on Grade 7 and Grade 9 exams. The table also reveals that the aggregate performance of girls is similar to that for boys.

[31] Also provided in the data set were the codes for testing centers as well as the names of the testing centers.
[32] The percent sitting for the exams was calculated by dividing the total number of test results in the 2014 English exam (the most common) by the total Grade 7 or Grade 9 enrollment reported in the MOGE EMIS in 2013-14. Examinees can come from other types of institutions not used in the calculation (adult education centers, for example). Percentages of students sitting for the Grade 9 exam greater than 100 percent are the result of adults in nontraditional programs taking the Grade 9 exam to qualify for further education and also of those repeating the exam in order to progress in the system.
[33] For Grade 7 results, students were awarded scores of pass, credit, merit, or distinction. For Grade 9, students were awarded scores of fail, pass, credit, merit, or distinction.

Table 5. Distribution of Grade 7 and Grade 9 Exam Results

Percent Sitting for Exam						
	Grade 7 Exams			Grade 9 Exams		
	Lowest	Middle 50%	Highest	Lowest	Middle 50%	Highest
Total	51%	85% to 98%	179%	68%	101% to 131%	647%
Male	60%	86% to 98%	187%	72%	101% to 135%	760%
Female	38%	84% to 99%	172%	62%	99% to 137%	523%
English (% credit, merit, or distinction)						
	Grade 7 Exams			Grade 9 Exams		
	Lowest	Middle 50%	Highest	Lowest	Middle 50%	Highest
Total	31%	40% to 57%	74%	10%	26% to 43%	62%
Male	29%	41% to 57%	75%	9%	25% to 40%	64%
Female	24%	39% to 57%	78%	10%	26% to 43%	60%
Maths (% credit, merit, or distinction)						
	Grade 7 Exams			Grade 9 Exams		
	Lowest	Middle 50%	Highest	Lowest	Middle 50%	Highest
Total	33%	43% to 57%	71%	10%	21% to 38%	63%
Male	30%	47% to 60%	76%	10%	22% to 38%	63%
Female	23%	40% to 54%	68%	7%	17% to 37%	65%

SECTION 4

EQUITY AND INVESTMENT

Public investment in education is supported by both efficiency and equity arguments. When gains in productivity and other beneficial outcomes exceed the costs of the public investment in education, there is a positive social return (efficiency improvement). Many of these same public investments in facilities, teachers, materials, and other resources also reduce barriers for disadvantaged groups and improve equity.

In assessing equity in the Zambia education system and how it can be enhanced, it is important to recognize the contribution of current GRZ policies like increasing budgetary allocations, eliminating school fees, expanding the number of schools, and increasing the number of teachers. In addition to this public investment, GRZ has also adopted policies and implemented programs intended to address specific equity challenges in Zambia. These policies and programs include initiatives in school health like deworming and school feeding; the expansion of facilities and trained teachers for learners with special education needs; direct support of OVCs by providing materials and bursaries; and most recently, adopting a formal re-entry policy that facilitates girls remaining in school during pregnancy and a timely return to school after giving birth.

GRZ (often with the support of development partners) has also invested in campaigns focused on promoting participation for excluded groups, like special needs learners, girls, and OVCs. Equity as an education-sector policy priority is reflected in planning and budgeting guidelines through a specific allocation for equity activities (i.e., a percentage of the budget ceiling).

While public investment in education in Zambia has undoubtedly resulted in greater levels of educational attainment, higher productivity, improved living standards, and greater equity, some gaps remain, and the investments necessary to close them will compete with other national priorities for available resources. Identifying appropriate equity indicators or benchmarks will support decision makers to ensure that available resources can be targeted to improve equity in a cost-effective manner.

This document uses two approaches to identify relevant benchmarks for enhancing planning and monitoring for education equity in Zambia. One approach draws key relationships between policy, investment, and equity from international experience. Many of the policies and investments that have demonstrated a relatively larger positive impact on disadvantaged groups globally — such as mother tongue instruction, improving physical accessibility of schools, expansion of early childhood education (ECE) services, and direct cash subsidies to students/households — are being implemented to some degree in Zambia. As a result this first approach is complemented by a second: an empirical analysis of the relationship between policy, investment, and outcomes in Zambia.

RESOURCES, INVESTMENT, AND EDUCATIONAL ATTAINMENT

To support the development of a framework to promote cost-effective investment in enhancing equity and improving overall results, the relationship between school characteristics, school resources, and outcomes was analyzed using multivariate analysis. A full description of the models as well as a non-technical summary is provided in Annex 1.

While there are important limits to inferring causality in this cross-sectional analysis of school resources and survival rates, a multivariate model provides a means of examining the relationship between a particular school characteristic or resource of interest and school-level survival rates net the influence of other characteristics and resources. For example, the model results for difference in survival rates associated with differences in teacher experience is the estimate of the relationship disentangled from the effects of other characteristics (size, student-teacher ratio, student-classroom ratio, bursaries provided, etc.).

Large changes in the number of pupils enrolled in a school — either positive or negative — can have effects on the calculation of school-level survival rate that are independent of policy and investment. These abrupt changes in school enrollment can be the result of changing population patterns or errors in reporting and in data capture of enrollment and/or repeaters. Two "new entrant" variables were included in the model as a means of reducing the impact of large unexplained changes in enrollment in schools in the two consecutive years used for estimation (2012-13, 2013-14). These "new entrant" variables capture the number of pupils in Grades 2 through 4 and Grades 5 through 7 that are in excess of what would be expected if 100 percent of pupils successfully transitioned from one grade to the next.[34]

Overall the school characteristics and resources included in the model capture about 60 percent of the variation in school-level survival rates for Grade 4 and about 30 percent for Grade 7. The estimated association between school characteristics, school resources, and Grade 4 and 7 survival rates included school governance and student population, school programs, teachers, materials and infrastructure, and student support, as described below.

SCHOOL GOVERNANCE AND STUDENT POPULATION

- For Grade 4 survival rates, there was no difference between estimated survival rates for public and private schools, while the expected Grade 4 survival rate for community schools was about 28 percent lower than the expected rate for a public school. For Grade 7 rates, private schools had an expected rate about 10 percent higher than a similar public school.[35] There was no statistically significant difference in Grade 7 survival rates for public and community schools.

[34] The estimating models were run both with and without the inclusion of the "new entrant" adjustment. There were no substantively important differences between the two models with respect to which resources and characteristics exhibited a statistically significant association with school-level survival rates.

[35] In interpreting these differences — as well as those for other school characteristics and resources — it is important to keep in mind that the 10 percent difference is a difference in expected survival rates of 10 percent, not an additional 10 percentage points. For example, a 10 percent improvement of a 60 percent is survival rate is 66 percent rather than 60 percent plus 10 additional percentage points.

Once differences in available resources and other school characteristics are accounted for, there is little difference in the performance of public and private schools in retaining children in school and their grade to grade progression. However, community schools do more poorly than public schools by about 25 percent in retaining children to Grade 4. The absence of a statistically robust estimate for the relationship between community schools and Grade 7 survival rates is due in part to the very small number of community schools that offer Grade 7.

- The percentage of girls in the school enrollment has a statistically significant but very small negative correlation with Grade 4 survival rates: a 10 percent increase is associated with a 0.5 percent lower Grade 4 survival rate. There was no statistically significant relationship between the percentage of girls in a school's enrollment and Grade 7 survival rates.

The correlation between the percentage of female enrollment and Grade 4 and Grade 7 survival rates is consistent with the small differences in the aggregate survival rates presented in Table 5 (see Section 3). While girls are less likely than boys to survive to Grade 4 and Grade 7, the differences are quite small and improving parity between girls and boys would have a very limited impact on overall equity and overall results.

However, in tis important to emphasize that this perspective does not take into account the consequences of poor schooling outcomes for girls. International experience suggests that these consequences may be relatively larger and more negative than the consequences for boys in terms of reproductive health choices, HIV AIDS, and poverty. Attention to gender issues is clearly warranted on the basis of how education impacts life chances for girls regardless of the relative parity between boys and girls on basic indicators of persistence and attainment in Zambia.

- About 25 percent of Grades 1 through 4 enrollment is overage for grade.[36] A higher percentage of overage pupils in Grades 1 through 4 was associated with higher Grade 4 survival rates. However, there was a statistically significant and negative association between the percentages of overage pupils in Grades 1 through 4 and Grade 7 survival rates.

The positive association between the percentage of overage pupils in a school (Grades 1 through 4) and Grade 4 survival rates suggests that pupils below age 12 or 13 tend to remain in school regardless of how many grades they have successfully completed. The negative association between the percentage of pupils overage for grade in Grades 1 through 4 and Grade 7 survival rates suggests that being overage for grade does begin to have an impact on remaining in school once a child approaches an age where they can make an economic contribution to the household.[37]

[36] A student was considered overage for grade if he or she was two or more years older than the normal age for the grade. Considering age 7 as the normal starting age for Grade 1, all students 9 years of age and older were classified as overage for grade. The same rule was applied to categorize children in Grades 2 through 4 as overage for grade.

[37] This interpretation requires the assumption that differences between schools with respect to the percentage of students in early grades who are overage has remained relatively stable over recent years.

- The percentage of a school's enrollment composed of orphans (one or both parents deceased) had a statistically significant but very small positive association with both Grade 4 and Grade 7 survival rates.

The positive association between the percentage of orphans in a school and survival rates is somewhat counterintuitive. It is important to keep in mind that the impact is quite small and is calculated on the basis of school/grade enrollments rather than a longitudinal analysis of individual students. What the model results imply is that, through Grades 4 and Grade 7, there is little difference between orphans and other pupils in the likelihood of persisting in school. Since the model incorporates only school-level resources, it does not provide insight into how different amounts or types of support for orphans affect their participation in education.

SCHOOL PROGRAMS

- Schools that offer Grade 7 or higher have higher Grade 4 survival rates than schools that do not. The estimated difference between schools similar in other characteristics offering Grade 7 or higher and schools that do not was 74 percent.

The mean Grade 4 survival rate for school offering Grade 7 is 86 percent while the mean for schools not offering Grade 7 is 52 percent.

- Schools that offer preschool have higher Grade 4 and Grade 7 survival rates than similar schools that do not: about 15 percent higher for Grade 4 and 10 percent for Grade 7.

A proxy variable for participation in preschool was constructed by calculating the ratio of reported preschool enrollment in a school (ages 4, 5, and 6) and new entrants (enrollment minus repeaters) in Grade 1. For schools where this preschool to Grade 1 ratio was less than 50 percent, Grade 4 survival rates averaged 80 percent, while the Grade 4 survival rate for similar schools where this ratio is above 50 percent is about 90 percent. The corresponding difference for Grade 7 survival rates is also about 10 percent. Individual-level data on whether a child had previously attended preschool is not available. However, the association between offering preschool and higher Grade 4 and Grade 7 survival rates may indicate that participation in preschool has a positive impact on the likelihood of persisting in school until primary completion.[38]

TEACHERS

- Higher mean years of teacher experience in a school was associated with an improvement in both Grade 4 and Grade 7 survival rates.

[38] An important caveat is that there could be other factors not included in the model that have an impact on whether a school provides preschool and the likelihood that children remain in school. While these other confounding effects can't be discounted, the observation that schools with preschool have higher survival rates to Grades 4 and 7 than schools that do not is an interesting observation for decision makers. Sustaining healthy levels of preschool participation in a community is likely to promote better education outcomes at higher levels through a number of mechanisms.

Increasing mean years of teacher experience in a school from 5 years to 9 (mean level teacher years of experience for schools included in the model) is associated with about a 42 percent improvement in the expected Grade 4 and Grade 7 survival rate.

- Schools where 25 percent or more of the teachers report that they have no qualification have lower expected Grade 4 and Grade 7 survival rates than similar schools where less than 25 percent of teachers are unqualified. The estimated difference for Grade 4 survival rates is about 20 percent and about 10 percent for Grade 7.

About 25 percent of the schools included in the estimation for Grade 4 survival rates have 25 percent or more unqualified teachers while the figure for schools included in the Grade 7 estimate was about 10 percent. The mean Grade 4 survival rate for schools with 25 percent or more of unqualified teachers is 60 percent while the mean for schools with fewer than 25 percent of teachers being without qualification is 85 percent.

- Low student-teacher ratios (under 30) were associated with lower Grade 4 and Grade 7 survival rates than schools where the ratio was between 30 and 60 pupils per teacher. Surprisingly, higher ratios (greater than 60 pupils per teacher) were associated with higher Grade 4 and Grade 7 survival rates.

One important limitation of the survival rate model is that it does not incorporate factors outside of school. The fact that some schools have relatively low survival rates despite favorable (low) student-teacher ratios may be linked to differing attitudes about education and demand for education in communities and to differences in the ability of communities to provide economic support for school attendance. Some schools may struggle to capture pupils despite the provision of infrastructure and staff while other schools may continue to attract pupils into already overcrowded schools because of the value a community places on education or the reputation of the school.

MATERIALS AND INFRASTRUCTURE

- Student-classroom ratios had inconsistent associations with survival rates. Very low student-classroom ratios (less than 20) were associated with lower Grade 4 and Grade 7 survival rates than schools with ratios between 20 and 60. Having a higher ratio (greater than 60 pupils per classroom) was associated with higher Grade 4 and Grade 7 survival rates.

These counterintuitive results are similar to those for student-teacher ratios. In addition to possible inaccuracies of reporting, other community characteristics that impact persistence in school may explain these results. Schools that have a reputation for poor performance or schools in communities where the priority on education and/or the economic capacity to support school attendance is lower may have underutilized public investments in education.

- Lower ratios of pupils to textbooks (English, math, and Zambian languages) were associated with higher Grade 4 survival rates, but the impact was quite small.

The expected difference in Grade 4 survival rates between a school with a student to text ratio of 4 to 1 and a school providing texts on a 1 to 1 basis would only be about 1 percent. There was no statistically significant result between availability of texts and Grade 7 survival rates.

- Better access to toilets was associated with higher Grade 4 and Grade 7 survival rates. Survival rates for schools where there was a ratio of pupils to toilets of 50 to 1 or less had expected Grade 4 survival rates 15 percent higher than schools where the ratio was more than 50 pupils per toilet[39] and for Grade 7 the difference was 20 percent.

The mean Grade 4 survival rate for schools with toilets available at a ratio of 50 pupils per toilet or less was 85 percent while the mean for other schools was 75 percent. The same relative difference was also reflected in Grade 7 survival rates; survival rates for schools with a ratio of 50 pupils per toilet or less was 67 percent and 60 percent in schools with no toilets or student-toilet ratios higher than 50 to 1. Only about 15 to 17 percent of the schools used in the model meet the criteria of 50 or fewer pupils per toilet.

- The provision of teacher housing had a mixed association with Grade 4 and Grade 7 survival rates. Schools where houses were provided had lower Grade 4 survival rates than schools that did not provide teacher housing. Schools providing teacher housing had higher Grade 7 survival rates (6 percent higher) than schools that did not provide teacher housing.

The logic of providing teacher housing is to encourage better qualified and experienced teachers to teach in more remote locations and also to improve the stability of the teaching staff in those schools. For the schools used to estimate the relationship between resources and Grade 4 survival rates, the average years of experience of teachers in schools providing teachers houses was slightly less than for schools without teacher housing. For the schools offering seven grades or more, the mean years of teacher experience was about one year greater in schools offering teacher housing than in schools that did not. The percentage of schools where 25 percent or more of the teachers reported no qualification was considerably lower in schools that do provide teacher housing.

SUPPORT FOR STUDENTS

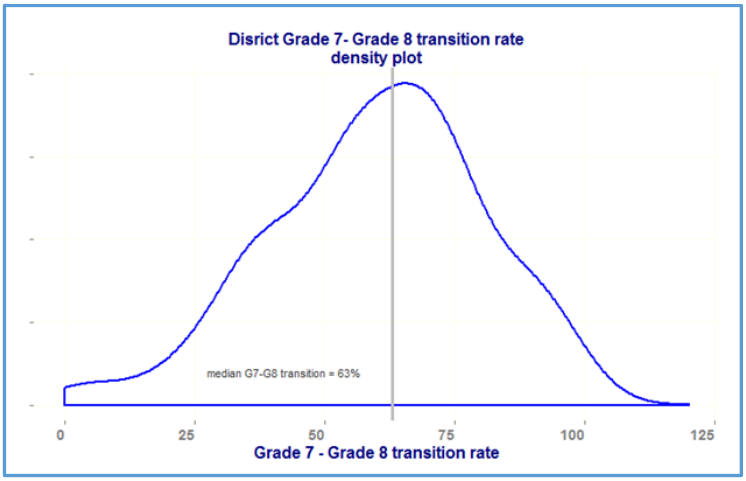
- Higher ratios of bursaries to pupils in a school was associated with higher expected Grade 4 and Grade 7 survival rates.[40] While the relationship was statistically significant and positive, it was also quite small: a 10 percent increase in the ratio of bursaries to pupils being associated with a less than 1 percent improvement in Grade 4 or Grade 7 survival rates.

[39] This figure also includes schools that did not report providing toilets.
[40] There was no statistically significant association between the ratio of bursaries to orphans in a school and Grade 4 or 7 survival rates.

Using the broad definition of orphan (one or both parents deceased), there were more than 345,000 orphans enrolled in the 6,660 schools included in the estimation of Grade 4 survival rates. The number of bursaries reported from all sources for this same number of schools was about 49,000, approximately one bursary for every seven orphans.

RESOURCES, INVESTMENT, AND TRANSITION TO POST-PRIMARY EDUCATION

Figure 3: District Grade 7 to Grade 8 Transition



Estimated survival rates to Grade 9 are about 20 percentage points lower than survival to Grade 7 (see Table 1, page 18). Reaching Grade 9 involves the transition from primary school (Grade 7) to the initial grade of post-primary education (Grade 8). This transition across levels often means the transition to another school. To capture this transition across levels, a transition rate was calculated by dividing Grade 8 enrollment in each district in 2013-14 by the Grade 7 enrollment in the previous year. The median transition rate between Grade 7 and Grade 8 for all districts was 63 percent (see Figure 2). Grade 7 to Grade 8 transition rates were essentially the same for boys and girls. Grade 7 to Grade 8 transition rates were 40 percent or less in 21 of the 102 districts and more than 75 percent in 24 of the districts.

A multivariate analysis was conducted of the relationship between characteristics of the Grade 7 enrollment, characteristics of the supply of Grade 8 places in the district, and the district Grade 7 to Grade 8 transition rate between 2012-13 and 2013-14. A full description of the model and estimates is included in Annex 2. The estimated association between school characteristics, school resources, and Grade 7 to 8 transition rates included school governance and student population, school programs, and support for students, as described below.

SCHOOL GOVERNANCE AND STUDENT POPULATION

- There was no statistically significant association between district Grade 7 to Grade 8 transition rates and differences in the percentage of Grade 7 pupils in public, private, and community schools.

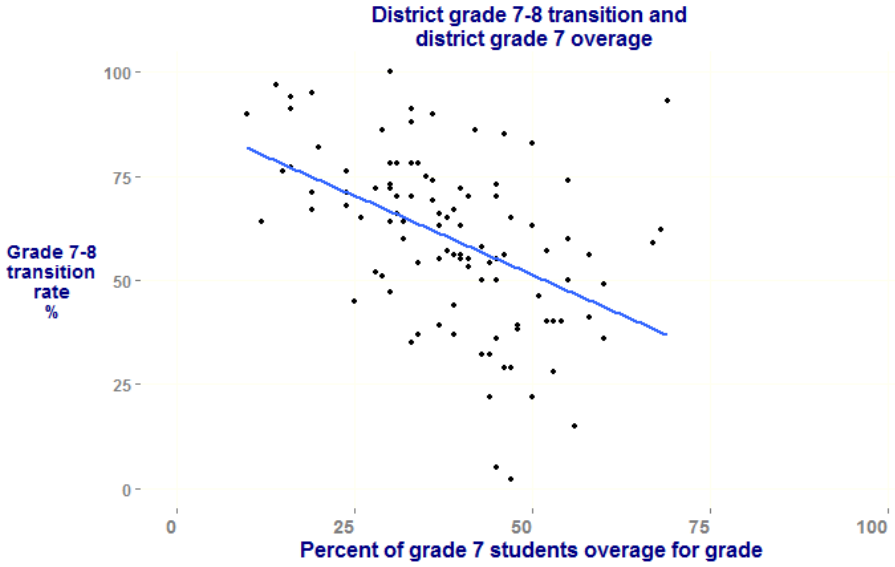
- The percentage of a district's Grade 7 enrollment that were orphans did not have a statistically significant relationship with the district Grade 7 to 8 transition

rate. There was also no significant relationship between the reported pregnancy rate for Grade 7 pupils in a district and the transition rate to Grade 8.

- The percentage of Grade 7 pupils in a district who are overage for grade did have a statistically significant and negative association with district transition rates from Grade 7 to 8.

The mean percentage of Grade 7 pupils who were overage for grade across all districts is 39 percent with the range of Grade 7 overage pupils in districts between 10 percent and nearly 70 percent. Each 10 percent increase in the percentage of overage pupils in Grade 7 in a district is associated with a 2.3 percent lower transition rate from Grade 7 to 8 (see Figure 3).

Figure 6: District Transition to Post-Primary Education and Age of Students



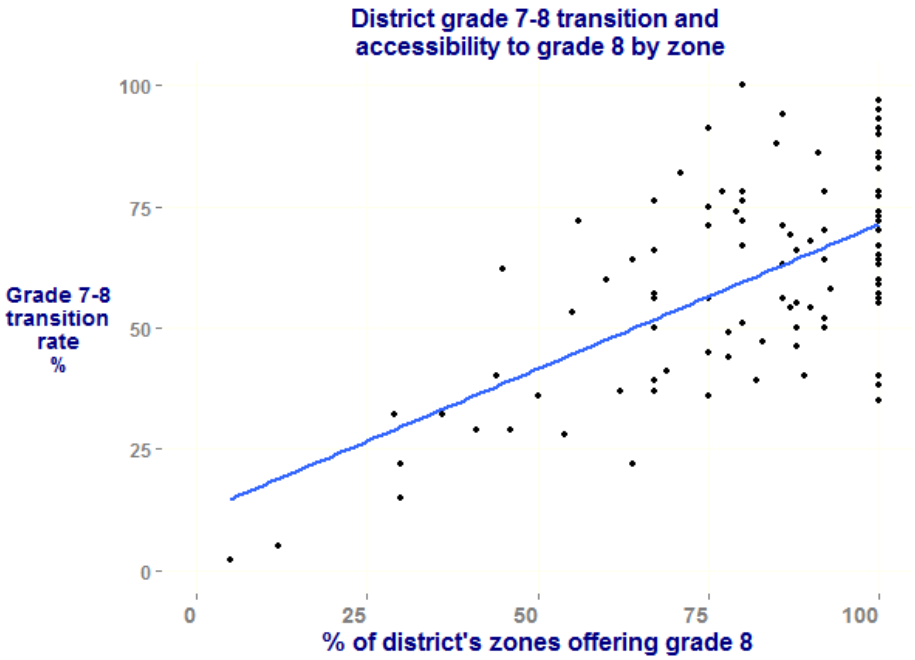
SCHOOL PROGRAMS

- The percentage of zones in a district that had a school offering Grade 8[41] had a statistically significant and substantively important positive association with district-level Grade 7 to 8 transition rates.

The mean percentage of a district's zones that offer Grade 8 was 81 percent. About 30 percent of the 102 districts provide access to Grade 8 in all zones within the district, while 20 percent of the districts provide access in 70 percent or fewer zones. The estimated relationship was nearly 1 to 1; a 10 percent increase in the percent of zones offering Grade 8 was associated with a 10 percent higher expected Grade 7 to 8 transition rate (see Figure 4). A more typical example would be two similar districts with five zones. A district offering Grade 8 in all five zones would be expected to have a transition rate about 20 percent higher than a district that offered Grade 8 in four of five zones.

[41] A zone that reported at least 20 students enrolled in Grade 8 in 2013-14 was included in the group of zones offering Grade 8.

Figure 8: Accessibility to Grade 8 and Transition to Post-Primary Education



- District transition rates between Grade 7 and Grade 8 were positively associated with the district's Grade 7 survival rate.

Grade 7 survival rates calculated at the district level average 64 percent across the 102 districts. Twenty percent of the districts have Grade 7 survival rates of 40 percent or less, while the 20 percent best-performing districts have Grade 7 survival rates of 80 percent or higher. Ten additional percentage points of Grade 7 survival rates were associated with about a 10 percent increase in the Grade 7 to Grade 8 transition. This finding suggests that improving the quality and capacity of primary schools to attract and retain pupils also has an impact on the likelihood that a student will continue on to post-primary education.

SUPPORT FOR STUDENTS

- The estimating model did not find a statistically significant relationship between (1) bursaries provided in a district and Grade 7 to 8 transition rates or (2) boarding places provided in a district and Grade 7 to 8 transition rates.

The lack of a statistically robust association between the number of bursaries provided for Grade 8 in a district or the number boarding places provided for Grade 8 in a district with Grade 7 to 8 transition cannot be interpreted as evidence that bursaries and boarding places have no impact on Grade 7 to 8 transition. Individual student data is required to assess the impact of a bursary and/or boarding places on the probability that a student continues in school. The lack of a relationship between the aggregate district-level provision and transition rates does however raise potential questions about the efficiency in allocation of boarding places or bursaries or whether the amount and type of support is effective.

Under the assumption that boarding places were efficiently allocated so that all pupils receiving a boarding place in Grade 8 would not have transitioned from Grade 7 without that support, the number of boarding places provided for Grade 8 in 2013-14 would be associated with an increase of nearly 9 percent in the national Grade 7 to 8 transition. Using the same assumption of perfectly efficient allocation of bursaries (all pupils who received bursaries for Grade 8 would not have otherwise attended), the number of bursaries provided to Grade 8 pupils in 2013-14 would have increased the Grade 7 to 8 transition rate about 5 percent. These estimates using the assumption of perfectly efficient allocation represent the upper bound of potential impact from the number of boarding places and bursaries provided in 2013-14. The actual impact would vary on the basis of (1) how well bursaries and boarding places were targeted to pupils who would not otherwise continue schooling and (2) the adequacy of the level of support for affecting the decision of pupils to continue schooling.

In addition to estimating the individual relationships between specific student characteristics, school-level resources, and survival rates (see above), an investment model was also constructed capturing the annualized equivalent of school-level differences in "spending" per student. While analysis of annual budgets may describe how spending in the current year was distributed among schools and students,[42] the resources that support instruction in classrooms represent a mix of short-term, recurrent spending in the current year — like teacher salaries — and long-term, capital spending on infrastructure, equipment, and materials. The investment model provides a comprehensive measure of the resources available to pupils in a given year and school converted to a monetary figure. While this figure is referred to as "spending" as shorthand in this analysis, a more accurate description is the estimate of the annualized resources consumed or invested per year per student in her/his school.

This model was constructed by converting the physical and human inputs into three types of spending estimates: infrastructure/materials, teachers and supplemental support for students. An annual per student spending for infrastructure and materials was estimated by converting the classrooms, furniture, student books (text and library), teacher books, and classroom equipment (computers, radios, televisions) into an annualized equivalent monetary amount using standard financial methods for discounting capital costs.[43] This annualized figure was divided by the number of pupils in the school to yield the estimate of per student annual spending on infrastructure and materials. The replacement costs (for example, the cost of a classroom) for the calculations were taken from the MOGE procurement standards where possible. The physical inputs used in the estimation of annual spending for infrastructure and materials included only items closely linked to providing instruction in classrooms. Items like laboratories, hostels, dining halls, and dining hall equipment and other types of capital goods were not included. While this annualized spending per student on infrastructure and materials captures the different amounts of physical inputs it does not incorporate differences in quality. For example**,** the estimated annual

[42] The examination of annual budgetary information frequently provides little insight into how even short-term spending is distributed among students and schools.
[43] For a full description of conversion of capital costs into annualized equivalents see Levin, H. M., & McEwan, P. J. (2001). *Cost-effectiveness analysis: Methods and applications*. Thousand Oaks, California: Sage Publications.

spending per student for classrooms would be identical for all schools with a student-classroom ratio of 50 pupils per classroom regardless of the age and condition of the classroom.

Spending on teachers was estimated by using the current salary scale for levels of qualification and a one percent annual increase linked to tenure in the school to calculate the "cost" of each teacher in the school. Per student spending on teachers was estimated by dividing the total spending on individual teachers in the school by the school enrollment. This estimated spending on teachers based on differences in qualifications and experience was used instead of actual spending in order to capture differences in quality of teachers that may not be captured in actual spending.[44]

Annual per student supplemental support available in a school was estimated on the basis of bursaries (total government and non-government) and boarding places provided. Each bursary was valued at ZMW 1,500 per year. The value per boarding place was estimated at ZMW 9,400[45] per year on the assumption of replacement cost capital expenditures on hostels at ZMW 4,000 per place with an expected lifetime of infrastructure of 15 years and recurrent costs for food and incidentals for boarding pupils at ZMW 50 per day for 180 days per year.

The investment model is intended to capture differences in resources available to pupils across the system rather than accurately estimate the cost of education. For the analysis of equity, it is more useful to see that one school has twice the available estimated resources as another school than to know the actual differences in costs that may be — at least in part — the result of administrative factors that would have little impact on the quality of classroom instruction.

Table 6: Correlation Between School Resources and Survival Rates

Correlations: school resources and survival rates		
	Grade 4	Grade 7
Teacher spending per student	0.24*	0.14*
Infrastructure/materials spending per students	0.09*	0.07*
Supplemental support spending per student	0.04*	0.05*

*significant at .05 or better

The investment model was used to examine resource allocation and survival rates to Grades 4 and 7. School resources per student for each category had a statistically significant correlation with Grade 4 and Grade 7 survival rates (see Table 6). Per student spending on teachers was more closely correlated with survival rates than infrastructure/materials spending or supplemental spending.

The relationship between resources and survival rates is more pronounced when evaluated at the extremes of the distribution. Schools in the bottom 20 percent of total available resources per student have Grade 4 survival rates about 36 percentage points lower than schools not in this group of schools (50 percent Grade

[44] Actual spending on teachers is affected by the type of school (public, private, community), the type of contract, and other administrative factors that may not be linked to qualifications and experience.

[45] The ZMW 9,400 annual cost for a boarding place was based on the assumption of replacement cost capital expenditures on hostels at ZMW 4,000 per place (hostel room initial cost for 25 student = ZMW 100,000) with an expected lifetime of infrastructure of 15 years and recurrent costs for food and incidentals for boarding students at ZMW 50 per day for 180 days per year.

4 survival rate versus 86 percent survival rate).[46] The 20 percent poorest resourced schools had Grade 7 survival rates about 7 percentage points lower (67 percent versus 74 percent) than other schools.[47] [48]

RESOURCES, INVESTMENT, AND LEARNING OUTCOMES

In order to explore the relationships between learning outcomes, student/community characteristics, and education resources and investment, an effort was made to match ECZ testing center exam results for Grade 7 to schools where those centers were located.[49] The matching was undertaken using the R statistical software program and several alternative algorithms to identify the best match (least number of differences) between two strings of characters: in this case, the names of testing centers and names of schools.[50] To facilitate the matching, a new identifier for each testing center and school was constructed to improve the likelihood of an accurate match. The new identifier was constructed by concatenating the first 15 characters of name of the school or testing center with the name of the district where the school or testing center was located. In this manner, the district where a school or testing center was located as well as the name provided by the MOGE EMIS and ECZ data was used to match centers and schools. The first step in the matching process was to generate the closest match from the 5,393 test centers to schools. This initial matching was reduced using only the 80 percent of closest (best) matches. The primary obstacle to matching testing centers to schools was differences in names used in the two data systems. For example, a school might be listed in one information system with just the name of its village location and in the other system may also include "primary school" or "basic school" in the name. Incomplete names also resulted in a number of "many to one" matches, where a single name in one system had a close and equal match to more than one record in the other system.

A second phase of developing an analyzable set of school–testing center matches eliminated schools where data was incomplete, resulting in a set of 2,219 Grade 7 school–testing center matches. Table 7 summarizes the results for the matched schools for Grade 7 English and mathematics results. A multivariate model was used to analyze the relationship between the percentage of pupils sitting for the Grade 7 exam in these schools who

Table 7. Summary of School-Level Grade 7 Exam Results

Grade 7 Exam Results		
2,219 "matched" schools		
% scoring credit, merit, or distinction		
	English	Mathematics
Mean	48%	52%
Middle 50%	28%-68%	33%-70%
	Gender Parity, English exam	
Mean	1.03	
Middle 50%	0.69-1.20	

*estimated for zones

[46] Statistically significant group differences at .001 Welch Two Sample t-test.
[47] Also statistically significant at the .001 level using a two samples t-test.
[48] While the differences between survival rates for the bottom 20 percent are not as large for Grade 7 survival rates, it is important to keep in mind that the group of schools that offer Grade 7 are better resourced than schools that do not.
[49] About 75 percent of primary schools offer Grade 7. Students attending a school that also serves as a Grade 7 testing center are likely to sit for the Grade 7 exams in the same school that they are attending and most likely have attended for at least two to three years. For Grade 9 exams, the relationship between schools where students study and the ECZ testing center is much less direct, as there are many fewer testing centers for Grade 9 — as well as many fewer schools — and the population of examinees at a given center may come from a number of schools or other types of education and training institutions.
[50] See for example: https://cran.r-project.org/web/packages/stringdist/stringdist.pdf.

scored credit, merit, or distinction[51] and a set of student characteristics and school-level resources similar to those used in the model examining survival rates. Full results of the model are presented in Annex 3.

The overall power of student characteristics and school resources in explaining differences in exam outcomes in English and mathematics was quite modest. The variables included in the model explained only about 3 percent of the differences among schools in exam results. However, there were some point estimates that were statistically significant. A student-teacher ratio much higher than the typical 30-60 pupils per teacher level was associated with lower exam results in both English and mathematics, as were very low (30 pupils per teacher or lower) student-teacher ratios. Exam outcomes were also higher in schools where the preschool enrollment suggests that many pupils in the school may have attended preschool: about 24 percent higher than in schools with no preschool.[52]

Table 8: Correlations Between G7 Learning Outcomes and School Resources (School Level)

Correlations: percent of examinees scoring credit, merit, or distinction	
	G7 English
Teacher spending per student	0.24*
Infrastructure/materials spending per student	0.20*
Supplemental support spending per student	0.04*

*significant at .05 or better

The differences across schools in Grade 7 exam results was also analyzed using the investment model previously used in analyzing survival rates. Simple correlations between the percent of pupils in a school scoring credit, merit, or distinction and per student spending on teachers, infrastructure/materials, and supplemental support all were positive, statistically significant, and small (see Table 8). Again evaluating outcomes at the extremes of the resource distribution, schools in the bottom 20 percent of school-level resources available did have a lower mean percentage of pupils achieving credit, merit, or distinction; a mean of 45 percent in these less well-resourced schools versus a 50 percent average in schools not in this group. In a multivariate model (Annex 3) incorporating the three categories of resources, only spending on teachers per student exhibited an independent statistically relationship with Grade 7 English exam outcomes.

The simple correlations and multivariate coefficients yielded statistically significant results, however the results come with important caveats. While meeting conventional standards of statistical significance, the correlations suggest a very weak relationship between school-level differences in spending and outcomes on Grade 7 examinations in English. In the multivariate model, school-level differences in the three categories of school spending explain less than 2 percent of the variation of exam results across the 2,219 schools. Finally, the number of school–testing center matches included in the analysis was only about 50 percent of the testing centers. While the analysis was limited to the "best" matches of testing center and schools based on names, this elimination of 50 percent of the potential school–testing center matches may have resulted in a non-representative sample of exam results by school.

[51] For Grade 7 results students are classified by ECZ as pass, credit, merit, or distinction.
[52] See the earlier description of the construction of the proxy indicator for preschool participation (page 29).

The nature of the two data systems (MOGE, ECZ) present challenges in accurately matching Grade 7 testing centers to schools. However, each testing center is unambiguously linked to a district. Table 5 (page 24) summarized the percentage of those sitting for exams in a district who scored credit, merit, or distinction on Grade 7 and Grade 9 examinations in English and mathematics. Using English exams as a reference, gender parity in results was 0.98 for Grade 7 and 1.06 for Grade 9.

Though summaries of district-level exam results can provide a description of differences in learning outcomes across districts, they provide little insight into what determines those differences. To examine the relationships between student characteristics, school-level resources, and learning outcomes at the district level, a set of descriptive summary variables capturing differences in school characteristics and resources within a district was constructed using MOGE EMIS data for 2013-14. In each case, there was an effort to maintain the emphasis on how the schooling experience varies for pupils within a district rather than using district aggregate mean values.

For example, assessing the relationship between differences in district-level mean student-teacher ratios and learning outcomes does not capture how teachers are distributed across schools. Districts with similar means could have quite different distributions of student-teacher ratios at the school level.

In order to incorporate the impact of differences in the distribution of teachers within districts into the analysis, the district-level summary variables on student-teacher ratios reflect the percentage of the overall Grade 1 to 8 enrollment that attend schools where the student-teacher ratio is below 30, between 30 and 60, between 60 and 85, or over 85 pupils per teacher.[53] A similar method of calculation on the basis of student experience at the school level was used to construct other district summary variables. These include the percentage of district Grade 1 to 8 enrollment that are:

- attending private schools
- attending community schools
- attending schools where teacher housing is provided to 50 percent or more of teachers
- attending schools where sum of textbooks in English, mathematics, and Zambian languages is two pupils per text or less (separately for Grades 1 through 4 and Grades 5 through 7)
- attending schools where 25 percent or more of the teachers are without qualifications
- attending schools where pupils have access to toilets at a ratio of 50 pupils per toilet or less.

In addition, for each district, the ratio of bursaries reported to the number of orphans (both parents) and the percentage of reported orphans (one or more parents) was calculated.

[53] The nature of the MOGE EMIS data does not permit a reliable calculation of student-teacher ratios by grade or class.

In simple correlations, only the percentage of enrollment in private schools (+.37), the percentage of pupils in schools with toilets at a ratio of 50 pupils per toilet or less (+.32), and the percentage of student in schools with low student-teacher ratios (-.26) had statistically significant correlations with Grade 7 district exam outcomes[54] in English. Only the percentage of private school enrollment exhibited a statistically significant correlation with Grade 9 exam results in English and mathematics.[55]

Table 9: Correlations Between District G7 and G9 learning Outcomes and School Resources (District School Level Means

Correlations: percent of examinees scoring credit, merit, or distinction		
School means for district	G7 English	G9 English
Teacher spending per student	0.39*	0.34*
Infrastructure/materials spending per student	0.47*	0.33*
Supplemental support spending per student	0.18	0.23*

*significant at .05 or better

These same variables were used in a multivariate model to examine the independent relationship between the distribution of district summary characteristics and Grade 7 and Grade 9 exam outcomes in English and mathematics (Annex 4; see also Table 9). The overall explanatory power of the district variables was very low for Grade 7 exam results, with none of the district summary variables having a statistically significant association with exam results. For Grade 9 exam results, the goodness of fit of the model was somewhat better with the percentage of district enrollment in private schools having a statistically significant association with higher percentages of pupils scoring credit, merit, and distinction and low student-teacher ratios being negatively associated with Grade 9 exam results.

While the results of assessing the relationship between district differences in school-level resources — measured as discrete characteristics (student-teacher ratios, classrooms, textbooks, etc.) — were mixed, the investment model where resource differences at the school level are captured comprehensively did suggest a relationship between available resources and examination outcomes. District-level mean spending per student on teachers and infrastructure/materials were positively correlated with differences in the percentage of examinees who scored credit, merit, or distinction on Grade 7 and Grade 9 examinations. The districts in the bottom 20 percent of mean total spending per student had a lower percentage of examinees scoring credit, merit, or distinction on Grade 7 English examinations; 43 percent versus 50 percent[56] for districts not in the bottom 20 percent of mean spending per student. There were no appreciable differences for Grade 9 English results.

[54] The percentage of students in the district scoring credit, merit, or distinction.
[55] Raw Grade 9 individual results are converted to scores of fail, pass, credit, merit, or distinction by ECZ. As is the case with the analysis of Grade 7 scores, the performance of districts was measured by the percentage of examinees achieving credit, merit, or distinction.
[56] Differences in means were statistically significant at .001.

SECTION 5

SUMMARY AND RECOMMENDATIONS FOR PLANNING AND MONITORING FOR EQUITY

The purpose of this analysis of equity was to identify indicators and benchmarks to support decision makers in improving equity and overall outcomes in the education system. The proposed indicators and benchmarks was identified via an assessment of how outcomes vary across pupils and schools and the relationship between differences in student outcomes, school/student characteristics and school level resources. The proposed indicators are not comprehensive indicators of education system performance, but rather suggested additions for strengthening the equity focus of other decision-support systems being managed by the Ministry. Notable among these current decision support system development efforts are the ongoing refinement of the Ministry Evaluation Plan, the renewal and refinement of the district monitoring system through collaboration with the UNICEF assisted "Let Data Speak" initiative and support for operational time-sensitive decision support at the district level (Local Learner Performance Tracker) developed with support of the USAID-funded STEP-Up Zambia project.

The analysis of equity examined barriers that adversely affect the amount of schooling children complete (educational attainment) and the knowledge and skills they acquire (learning outcomes). These outcomes were operationalized in the assessment as the survival rates to Grades 4,7,9 and 12 (attainment) and the percentage of examinees in national examinations in English and Mathematics achieving a threshold score of credit, merit or distinction (learning outcomes). Multiple methods were employed to better understand the factors/ barriers that adversely affect the amount of schooling a child completes and/or what skills and knowledge are acquired.

While Grade 12 outcomes were described, those outcomes were not analyzed. Most of the inequities in the system are already established in determining which children reach the secondary level (enter Grade 8). While there are pupils who are unable to successfully pass Grade 12 exams, there is much less year on year desertion of schooling in Grades 10 through 12.

Before summarizing results and implications, it is important to acknowledge the important constraints on the assessment and the limits to interpretation resulting from these constraints. The document explores the use of existing data sources for monitoring equity. While the use of the existing sources has obvious advantages in terms of not requiring additional expensive data gathering exercises, there are important limitations that should be acknowledged. Individual, household and

community factors play an important role in student outcomes. However, the education sector data limits the analysis to an examination of the relationship between outcomes and the characteristics of schools.

The education sector data is also aggregated at the level of schools and classes – not individual students. While it may be possible to identify relationships between better or poorer outcomes and the characteristics of schools, caution must be used in attributing the "cause" of poor outcomes. For example, knowing that very low-PTR schools have poorer results may be a good predictor of results or a useful indicator to track, however it does not explain why results are poor or offer an immediate policy solution.

Finally, the use of the existing data as a source of information for monitoring and planning for equity requires that the analysis focus on how outcomes and the characteristics of schools are distributed. This focus on individual schools as the unit of analysis is more sensitive to errors in data reporting and data capture than using the same data to report aggregate results for the nation, region or district. For example, a reporting error at the school level could result in a promotion rate of greater than 100 percent while this individual school reporting error would have very little impact on a promotion rate calculated for an entire district. Making these errors more visible is a necessary trade-off in using the existing data sources to plan and monitor for equity. While these outlier results attract attention they are relatively few and if one assumes that these errors are random they should not bias the analysis of school characteristics and outcomes.

As a baseline of current system performance about 90 percent of children entering Grade 1 today would be expected to reach Grade 4. About 65 percent would be expected to reach Grade 7 and just less than half enter Grade 9. About 30 percent would be expected to survive to enter Grade 12. In these aggregate estimations girls are equally likely to reach Grade 4 and roughly 10 percent less likely than boys to reach Grades 7, 9 and 12.[57]

Underlying these aggregate rates are school level rates that vary considerably. In 25 percent of the schools the expected rate of survival to Grade 4 is less than 50 percent who enter Grade 1. For 25 percent of schools only about 30 percent who enter Grade 1 would be expected to reach Grade 7. In 25 percent of the more than 800 zones in the education system 20 percent or fewer pupils who enter Grade 1 reach Grade 9 and about 10 percent reach Grade 12.

The district average percentage of Grade 7 examinees in English who scored credit, merit or distinction was 47 percent for boys and 46 percent for girls. In about 20 percent of districts the percentages achieving credit, merit or distinction was below 39 percent (boys and girls). The average percentage of examinees achieving credit, merit or distinction in Mathematics in districts was somewhat lower and the differences for girls and boys were somewhat wider – 52 percent for boys and 46 for girls. The percentages of Grade 9 examinees achieving credit, merit or distinction was lower in both exams (English 32 percent, Mathematics 27 percent). As was the

[57] For example, grade 12 survival rate of 27 percent for girls is about 10 percent less than the 30 percent expected survival rate for boys.

case with Grade 7 exams, there was parity in the English exam and a 6 percentage point disadvantage for girl examinees in Mathematics.

The analysis identified a number of factors that impact (negatively or positively) the likelihood that children remain in school and progress through the grades and achieve better learning outcomes. These are (1) physical accessibility of schools, (2) age of students, (3) teacher allocation and quality, (4) early education, (5) school facilities, (6) gender, (7) supplemental support for students, and (8) comprehensive equity in school resources.

PHYSICAL ACCESSIBILITY OF SCHOOLS

Survival rates to Grade 4 are much higher in **schools that offer at least seven grades** than in schools with similar resources that offer fewer than seven grades regardless of the type of school. While the mean across all districts is 84 percent of primary schools offering seven grades or more, in about 20 percent of districts 25 percent or more of the pupils attend schools that do not offer Grade 7. System-wide, about 23 percent of primary grade pupils attend a school that does not reach Grade 7.

Policy recommendation: Accelerate the provision of complete primary schools (to Grade 7) will improve equity and overall Grade 4 and Grade 7 survival rates.
M&E: Track over time the percent of the district's primary enrollment that attends a "complete" primary school (number of pupils attending school with Grade 7/total basic education enrollment).

Low-PTR schools (measured by student-teacher ratios under 30 to 1) lose about 10 percent more of their pupils before reaching Grade 4 than equally resourced typically sized schools (student teacher ratio between 30 and 60 to 1) or even overcrowded schools (student teacher ratios 85 to 1 and above). Since lower student-teacher ratios are generally assumed to promote positive results, this relationship suggests that there are other factors common to this group of schools that are responsible for their lower survival rates. The reasons for lower survival rates may also differ across these schools. While the analysis of the available education data systems does not explain why these schools have lower survival rates, efforts to track low-PTR school performance and address the underlying causes would contribute to improved equity.

Policy recommendation: Invest and support appropriate interventions to improve performance in low-PTR schools. Improving the results in low-PTR schools (which are often small and isolated) reduces inequity linked to barriers of geographical and local development disadvantages.
M&E: Annually track the performance (repetition, dropout, survival) of low-PTR schools relative to overall district performance

Survival rates to Grade 4 in **community schools** were about 25 percent lower when compared to public and private schools with similar levels of resources. This suggests that the lower survival rates in community schools are not attributable to

differences in school resources but rather to other factors like the management of school programs or the types of communities served by the schools.

Policy recommendation: Raise community school performance to parity with public schools through well-targeted additional support and investments, which could improve both equity and overall rates of educational attainment.
M&E: Annually track the performance (repetition, dropout, survival) of community schools relative to overall district performance.

The **distribution of opportunities for post-primary schooling** (Grade 8 and above) is associated with differences in transition rates to post-primary schooling. Transition rates from primary to post-primary education (Grade 7 to Grade 8) were lower in districts where a lower percentage of zones had schools with Grade 8 classes. This relationship suggests that it is not only the number of school places available for post-primary schooling (Grade 8 in this case), but also how those places are distributed geographically. The more widely distributed the opportunities to continue to Grade 8, the higher the rate of transition.

Policy recommendation: Improve geographical access/distribution to post-primary grades to improve equity in educational attainment (rather than focus on aggregate number of places – distribution of schools is also important).
M&E: Monitor the distribution of post-primary grade school places. (By zone, ward or other appropriate administrative region — ratio of Grade 7 pupils to Grade 8 capacity — or alternative grade transition depending on the district).

AGE OF STUDENTS

The percentage of pupils overage for grade[58] in a school was not associated with lower survival rates to Grade 4. However, schools with larger percentages of overage pupils tended to have lower Grade 7 survival rates than similar schools with fewer overage pupils. In transitioning to post primary education measured at the district level a 10 percent higher proportion of Grade 7 pupils overage for grade was associated with a 2.4 percent lower Grade 7 to 8 transition. The analysis suggests that pupils do remain in school despite being overage until they begin to reach an age where they can make other contributions to the household.

Being overage for grade can result from late entry to Grade 1, repetition, dropping out and reentering or a combination of the three. A quick calculation for 2014 suggests that as many as 20 percent of the Grade 1 enrolling pupils begin schooling already more than two years behind grade.

Policy recommendation: Promote entry into Grade 1 at the official age of 7 years. Identify schools with high levels of repetition or poor grade-to-grade transition in early grades.
M&E: Track age of Grade 1 entry in district schools as well as the percentage of overage children in early grades.

[58] Two years older than typical age for the grade assuming Grade 1 entry at official age of seven years.

TEACHER ALLOCATION AND QUALITY

Differences in the ***quantity and quality of teachers***[59] in a school was associated with school level variations in survival rates. Schools with higher average years of teacher experience had higher survival rates to Grade 4 and Grade 7 than similar schools with less experienced teachers. Schools that had 25 percent or more unqualified teachers had lower expected Grade 4 (by 20 percent) and Grade 7 (by 10 percent) transition rates than similarly resourced schools that did not have at least 25 percent unqualified teachers.

In the investment model higher per student teacher spending[60] was positively correlated with school level Grade 4 and Grade 7 survival rates and with higher percentages of pupils achieving credit, merit or distinction on Grade 7 English exams. Higher district school level mean spending per student on teachers was also associated with higher percentages of pupils in a district scoring credit, merit or distinction on Grade 7 and Grade 9 English exams.

Policy recommendation: Improve the equity of teacher allocation across schools comprehensively (quality and quantity), rather than only student-teacher ratios.

M&E: Track over time the equity in teacher allocation across schools using an index that incorporates quality rather than reliance on ratios (the investment model used in this analysis is an example of a measure that captures both the number and quality of teachers in a school).

EARLY EDUCATION

Schools that had a preschool on premises and where **preschool enrollments** of four-year-old and five-year-old children were at least 50 percent of Grade 1 enrollment also had Grade 4 survival rates about 15 percent higher than similarly resourced schools with no preschool or a preschool that was smaller relative to Grade 1 enrollment.

While having a preschool on premises may be a very imprecise indicator of whether children in the primary grades were likely to have attended preschool, it is the best we have in the existing data. Having a preschool on premises may also be associated with other factors that independently affect how likely pupils from a community are to persist in their schooling. Regardless, controlling for other school characteristics, having a preschool on premises is associated with higher survival rates to Grade 4.

Policy recommendation: Expand access to quality public preschool education – particularly in areas where private provision is scarce.

M&E: Track over time the ratio of preschool enrollment to Grade 1 enrollment by the relevant geographical region (zone, ward) within the district.

SCHOOL FACILITIES

[59] Here, quality of teachers is defined in terms of years of experience.

[60] The estimating method for teacher spending used an approximation of the sector salary scale that incorporates both level of qualification and years of experience. Differences in estimated teacher spending capture both differences in teacher experience and qualifications.

Schools where ***toilets*** are available at a ratio of one toilet per 50 pupils or lower have higher survival rates to Grades 4 and 7 (10-15 percent higher) than similarly resourced schools with lower provision of toilets (more than 50 pupils per toilet).[61] The differences in survival rates between schools with 50 pupils per toilet and school without toilets or toilets provided at greater than 50 pupils per toilet were statistically significant. The relationship between accessibility of toilets and survival rates did not appear to differ by gender.[62]

Policy recommendation: Pupils in schools with adequate provision of toilets have higher survival rates.

M&E: Track the percentage of school enrollment with access to adequate toilets at an appropriate threshold rate.

GENDER

The percentage of girls enrolled in a school did not have a statistically significant relationship with school level Grade 4 or Grade 7 survival rates. This is consistent with the aggregate estimation of survival rates to Grades 4 and 7 which were similar for boys and girls.

While girls are slightly less likely than boys to enter Grade 9 (see Table 1 on page 18), districts where a higher percentage of girls reach Grade 7 are also more likely to have a higher percentage girls transition to Grade 8.

Pregnancy rates in a school (number of reported pregnancies/female enrollment) had a statistically significant relationship with survival rates to Grade 4 and to Grade 7. However, the effect was quite small – a school with twice the pregnancy rate of a similar school would be expected to have survival rates that were just one percent lower. The pregnancy rate of Grade 7 girls in a district did not have a statistically significant association with district level Grade 7 to Grade 8 transition. However, it is important to interpret this finding cautiously. Early pregnancy can have a devastating impact on a girl's life. For this reason, efforts to address the issues of pregnancy and early marriage are imperative. The interpretation is not that pregnancy does not affect a girls' decision about schooling; only that the numbers of girls affected by pregnancy are very small relative to the entire population of girls enrolled in school.

The attention to pregnancy has resulted in a formal government policy on facilitating the re-entry of girls who have left school due to pregnancy.[63] Additions to the data collection instruments in the sector have been implemented to track both pregnancy and re-entry. In surveys and field visits decision makers indicated that practical implementation of re-entry policies could vary significantly from place to place and that the new data systems and capacity for analysis would need to be strengthened before the re-entry policy could be effectively monitored.

[61] When categorized into three groups — "no toilets," "toilets available at more than 50 students per toilet," and "toilets provided at 50 students per toilet or less" — the differences in survival rates between schools with toilets at more than 50 students per toilet and schools without toilets were not statistically significant.
[62] Separate estimates of survival rates for girls and boys were very similar in terms of the impact of toilets on survival rates.
[63] The policy also makes provisions for engaging with pregnant girls who are attending school to facilitate their absence for delivery and re-entry into the school.

Policy recommendation: Through much of education system girls are nearly as likely to persist in school and have relative parity in learning outcomes with boys. Many factors other than gender — like poverty and geographical differences in opportunities for education — play an important role in determining the amount of school an individual boy or girl is able to complete and their learning outcomes. However, gender remains an important equity concern because the consequences of low levels of education are likely more serious for girls than boys in terms of reproductive health choices, HIV/AIDS, and poverty. In particular, the consequences of early pregnancy and/or early marriage can be serious, life-long, and transmitted across generations.

M&E: Track equity more broadly, beyond an exclusive focus on gender.
Track and report spending on gender equity initiatives annually. Formally evaluate (external) at least one district gender equity initiative per year and report to province and national officials.
Implement periodic standardized sample-based monitoring of the re-entry policy (formal random sample of girls identified as beneficiaries of the re-entry policy).

SUPPLEMENTAL SUPPORT FOR STUDENTS

Direct support to pupils in the form of **bursaries** are provided by the GRZ and private/NGO sources. There was no statistically significant association between bursaries provided in schools at the primary level and survival rates to Grade 4 or Grade 7. There was also no statistically significant relationship between the percentage of students receiving a bursary at Grade 8 in a district and the district transition rate from Grade 7 to Grade 8.

In 2014, schools reported that 49,283 bursaries were provided to children enrolled at the primary level; about 65 percent from private sources. About 30 percent of the schools in the analysis of survival rates to Grade 4 and Grade 7 reported having bursaries from either government or non-government sources. For Grades 8 and 9 about 24,042 bursaries were provided with 70 percent of the bursaries from private/NGO sources.

It is difficult to assess the underlying effectiveness of bursaries as currently managed using the existing education data. The results do suggest that targeting of support could be improved. Orphans are the target for many of the bursary schemes. If bursaries from all sources provided to basic education pupils were perfectly allocated to children who had lost both parents, the number of bursaries reported would have been sufficient to provide assistance to about 30 percent of those children.

For Grade 8 only, schools reported 10,189 bursaries being provided to pupils (60 percent to girls); or an amount sufficient to provide a bursary to about 80 percent of the pupils enrolled in Grade 8 who had lost both parents (or 20 percent of those who had lost at least one parent). However, about 65 percent of the schools that report at least one child in Grade 8 as a double orphan did not report receiving any bursary support. With so few bursaries provided relative to the number of orphans and the low correlation between the number of bursaries provided in a school and

the number of orphans in the school, even bursaries that were very effective on an individual level may have very inefficient results (high costs of bursaries relative to improvements in system outcomes/indicators).

The lack of a statically significant relationship between bursaries provided and Grade 4 and Grade 7 survival rates at the primary level and transition rates to post-primary education (Grade 7 to Grade 8) at the district level should not be interpreted as evidence that bursaries do not improve persistence in school for a bursary recipient. Evaluating the effectiveness of the bursary schemes in promoting higher levels of attainment requires individual-level student data and a carefully constructed sample. Individual student-level analysis would provide insights into the relationship between bursary provision and the likelihood of remaining in school, how bursary provision impacts different types of pupils (gender, age, level of poverty, etc.), and the impact of the amount and type of bursary on the likelihood of pupils remaining in school.

Interviews and surveys results from district and provincial decision makers highlighted the provision of additional boarding places as priorities for improving results. School differences in the ratio of boarding places to enrollment was not associated with differences in school survival rates to Grade 4. There was a statistically significant association between boarding places and Grade 7 survival rates but the substantive impact was very small. There was no statistically significant association between the ratio of boarding places and Grade 8 enrollment in a district and the district transition from Grade 7 to Grade 8. As is the case with the assessment of the equity impact of bursaries, the impact of the provision of a boarding place on the persistence in school can only be assessed with individual level data that enables a reasonable estimation of how the provision of a boarding place affects the likelihood of remaining in school.

Policy recommendation: Direct support to pupils and households for the most vulnerable promotes equity and improves overall results. However, little is known about the effectiveness of bursary schemes and existing schemes may not be efficiently targeted to the most vulnerable. Unless schemes are effective and reasonably well targeted, they represent a loss of efficiency in the system (significant costs for little or no improvement in outcomes). The same concerns apply to the provision of boarding places.

M&E: a) Undertake studies on bursary schemes and boarding provision to determine their effectiveness in promoting higher levels of education attainment.

b) Strengthen (and potentially revise) targeting protocols for allocation of direct support to pupils based on the study of bursary schemes and boarding places and incorporate regular monitoring of allocation and performance of recipients.

COMPREHENSIVE EQUITY IN SCHOOL RESOURCES

In addition to estimating the relationship between individual school characteristics and pupil outcomes, an investment model was also constructed capturing the annualized monetary equivalent of all resources available to a student in a school.

While analysis of annual budgets may describe how spending in the current year was distributed among schools and students,[64] the resources that support instruction in classrooms represent a mix of spending in the current year — such as teacher salaries — and long term capital spending on infrastructure, equipment and materials. The investment model provides a comprehensive estimate of the resources available to pupils in a given year and school converted to a monetary figure. While this figure is referred to as "spending" as shorthand in this analysis, a more accurate description is the estimate of the annualized resources consumed or invested per year per student in each school.

This model was constructed by converting the physical and human inputs detailed in the school census data into three types of spending estimates; infrastructure/materials, teachers and supplemental support for students. An annual per student spending for infrastructure and materials was estimated by converting the classrooms, furniture, student books (text and library), teacher books, and classroom equipment (computers, radios, televisions) into an annualized equivalent monetary amount using standard financial methods for discounting capital costs. This annualized figure was divided by the number of pupils in the school to yield the estimate of per student annual spending on infrastructure and materials. The replacement costs (for example the cost of a classroom) for the calculations were taken from the MOGE procurement standards where possible.

Spending per student (estimated using the investment model) was analyzed in relationship to ECZ exam results in English and mathematics for Grade 7 and Grade 9. Individual exam scores were converted into a classification of the student's results into two categories: (1) having achieved credit, merit, or distinction or (2) having a lower classification of results.

It was possible to match ECZ exam center results in English and Mathematics for Grade 7 to about 2,200 schools. Spending per student on teachers and infrastructure in these schools was positively correlated with the percentage of examines who achieved credit, merit or distinction. While correlation was relatively weak, **there was a statistically significant relationship between higher levels of resources per pupil and better learning outcomes.**

For Grade 9 ECZ exam results it is not possible to link testing centers reliably to individual schools. Instead, district level percentages of examinees achieving credit, merit or distinction were analyzed in relation to mean district levels of spending per student from the investment model. As was the case for Grade 7 exam results, higher levels of spending per student on teachers and infrastructure was associated with higher percentages of pupils achieving credit, merit or distinction on Grade 9 examinations in English and mathematics.

The investment model was also used to examine resource allocation and survival rates to Grades 4 and 7. School resources per student for each category had a statistically significant correlation with Grade 4 and Grade 7 survival rates.

[64] The examination of annual budgetary information frequently provides little insight into how even short term spending is distributed among students and schools.

The relationship between resources and survival rates is more pronounced when evaluated at the extremes of the distribution. Schools in the bottom 20 percent of total available resources per student have Grade 4 survival rates about 36 percentage points lower than schools not in this group of schools (50 percent Grade 4 survival rate versus 86 percent survival rate). The 20 percent poorest resourced schools had Grade 7 survival rates about 7 percentage points lower (67 percent versus 74 percent) than other schools.

Policy recommendation: While a positive relationship between resources and learning outcomes is unlikely to surprise many decision makers, it is often difficult for managers to comprehensively assess and monitor how resources are distributed across schools. In the proposed benchmarks included in Annex 5 the investment model utilized in the analysis is applied to all schools and profiles are created for each district that enable decision makers to examine differences in resource endowments across districts and also to examine the relative inequality across schools within each district.

M&E: Develop and track indicators that comprehensively measure school level resources and inequality in school level endowments.

REFERENCES

Southern and Eastern Africa Consortium for Monitoring Educational Quality. (n.d.). *Country Reports*. Retrieved from SACMEQ: http://www.sacmeq.org/

United Nations. (2013). Addressing the multiple dimensions of Poverty and Inequality in Zambia: UN Zambia Signature Issues Series No. 1. Lusaka: United Nations.

United Nations Children's Fund. (2010). *Narrowing the Gaps to Meet the Goals.* New York: United Nations Children's Fund.

United Nations Children's Fund. (2015). *The Investment Case for Education and Equity.* New York: United Nations Children's Fund.

United Nations Children's Fund. (not dated). Simulations for Equity in Education: Background, Methodology, Results From First Two Years. unpublished.

Zambia Ministry of Education. (2010). *Education Sector National Implementation Framework III (2011-2015).* Lusaka: Zambia Ministry of Education.

ANNEX 1: MULTIVARIATE ANALYSIS OF GRADE 4 AND GRADE 7 SURVIVAL RATES

Dependent = log of school survival rate to grade 4

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.539205	0.117828	-4.576	4.83E-06	***
Log of enrollment	-0.131252	0.015026	-8.735	< 2e-16	***
% new entrants G1-4	5.359887	0.114247	46.915	< 2e-16	***
School has 7 grades or more	0.558563	0.024407	22.885	< 2e-16	***
Private school	0.023722	0.037882	0.626	0.531209	
Community school	-0.273658	0.029356	-9.322	< 2e-16	***
student -classroom ratio 60-100	0.241572	0.017415	13.871	< 2e-16	***
student -classroom ratio 100+	0.231111	0.022454	10.292	< 2e-16	***
student -classroom ratio < 20	-0.095158	0.053086	-1.793	0.073099	.
log of % of female enrollment	-0.140532	0.075026	-1.873	0.061106	.
Teacher houses provided (>2 teachers per house)	-0.03517	0.023341	-1.507	0.131928	
Teacher houses provided (<2 teachers per house)	-0.248069	0.01853	-13.387	< 2e-16	***
student-text ratio grades 1 to 4	-0.002342	0.001252	-1.87	0.061598	.
> 25% teachers w/out qualification	0.176034	0.027105	-6.495	9.03E-11	***
student-teacher ratio > 60 <85	-0.084969	0.024062	-3.531	0.000417	***
student-teacher ratio > 86	0.18025	0.01843	9.78	< 2e-16	***
student-teacher ratio < 30	0.282359	0.02275	12.411	< 2e-16	***
log of pregnancy rate in school	-0.021489	0.003555	-6.045	1.59E-09	***
preschool ratio to G1 less than 50 %	0.141111	0.036139	3.905	9.55E-05	***
preschool ratio to G1 50% or more	0.096613	0.035354	2.733	0.006301	**
student - toilet ratio 50 or less	0.135549	0.020326	6.669	2.82E-11	***
log of % of orphans in school	0.012693	0.004224	3.005	0.002667	**
log of mean teacher experience in school	0.066511	0.017415	3.819	0.000135	***
log of % overage for grade in school	0.044166	0.006805	6.49	9.29E-11	***
log of ratio bursaries to students in school	0.015124	0.002933	5.156	2.61E-07	***
ratio of boarding places to students	-0.231311	0.214548	-1.078	0.281022	

Signif. codes: 0 ‘***’ 0. 001 ‘**’ 0. 01 ‘*’ 0 .05 ‘.’ 0 .1 ‘ ’

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5102 on 5745 degrees of freedom
(889 observations deleted due to missingness)
Multiple R-squared: 0.6051, Adjusted R-squared: 0.6034
F-statistic: 352.1 on 25 and 5745 DF, p-value: < 2.2e-16

Dependent = log of school survival rate to grade 7

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-1.64637	0.1615039	-10.194	< 2e-16	***
Log of enrollment	0.076597	0.0208481	3.674	0.000242	***
% new entrants G1-4	3.42477	0.1493188	22.936	< 2e-16	***
% new entrants G5-7	4.35688	0.1502608	28.995	< 2e-16	***
Private school	0.100017	0.053752	1.861	0.062856	.
Community school	-0.00648	0.0452378	-0.143	0.886102	
student -classroom ratio 60-100	0.092039	0.0239674	3.84	0.000125	***
student -classroom ratio 100+	0.112335	0.031176	3.603	0.000318	***
student -classroom ratio < 20	-0.13739	0.0926513	-1.483	0.138185	
log of % of female enrollment	0.099386	0.1070808	0.928	0.353387	
:her houses provided (>2 teachers per house)	0.061337	0.0323148	1.898	0.057751	.
:her houses provided (<2 teachers per house)	0.005447	0.0284325	0.192	0.848072	
student-text ratio grades 1 to 4	0.000735	0.0016674	0.441	0.659235	
> 25% teachers w/out qualification	-0.10295	0.0410442	-2.508	0.012169	*
student-teacher ratio > 60 <85	-0.09401	0.032234	-2.917	0.003558	**
student-teacher ratio > 86	-0.00321	0.0246831	-0.13	0.896551	
student-teacher ratio < 30	-0.01275	0.0327377	-0.389	0.696984	
log of pregnancy rate in school	-0.00493	0.0046496	-1.06	0.288992	
preschool ratio to G1 less than 50 %	0.09201	0.0491236	1.873	0.061134	.
preschool ratio to G1 50% or more	-0.02641	0.0508215	-0.52	0.603304	
student - toilet ratio 50 or less	0.18134	0.0268743	6.748	1.71E-11	***
log of % of orphans in school	0.031924	0.0139053	2.296	0.021736	*
log of mean teacher experience in school	0.064902	0.0277438	2.339	0.019365	*
log of % overage for grade in school	-0.02186	0.0095435	-2.291	0.022028	*
log of ratio bursaries to students in school	0.015279	0.0139021	1.099	0.271821	
ratio of boarding places to students	0.723134	0.2907602	2.487	0.01292	*

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Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.6143 on 4177 degrees of freedom
  (759 observations deleted due to missingness)
Multiple R-squared:  0.3008,    Adjusted R-squared:  0.2966
F-statistic: 71.88 on 25 and 4177 DF,  p-value: < 2.2e-16
```

Summary of School level resources and survival rates

Resources:	+ or -	Grade 4 Survival Rate (G4 SR) *Compared to a school similar in other characteristics:*	+ or -	Grade 7 Survival Rate (G7 SR) *Compared to a school similar in other characteristics:*
Size of school	-	G4 SR associated with 0.13% decline for each 1% increase in school size	-	G7 SR associated with 0.05% decline for each 1% increase in school size
"New entrants"	+	An increase in the percentage of G2 to G4 enrolment new entrants to the school is associated with increasing the estimated G4 SR	+	An increase in the percentage of G2 to G7 enrolment new entrants to the school is associated with increasing the estimated G7 SR
School is private school	ns	There is no statistically significant difference between G4 SR for public and private schools	+	Private schools are associated with a 11% higher G7 SR than a similar public school
School is community school	-	The G4 survival rate for a community school would be expected to be about 28% lower than a public school	ns	There is no statistically significant difference between G7 SR for public and private schools
School offers G7 or higher	+	A school that offers grade 7 or higher would be expected to have about a 74% higher G4 SR that offered less than 7 grades	na	Schools must offer grade 7 to have a G7 SR
School has preschool	+	Schools that have preschools have about 15% higher G4 SR than schools that do not	+	Schools that have preschools have about 10% higher G7 SR than schools that do not
Student - classroom ratio of less than 20	-	Schools with student- classroom rations less than 20 students per classroom have expected G4 SR about 10 percent lower than schools with ratios between 20 and 60 students per classroom	ns	There is no statistically significant difference between G7 SR for students in schools where the student classroom ration is less than 20 and schools with ratios between 20 and 60 students per classroom
Student - classroom ratio greater than 60	+	Schools with student classroom ratios greater than 60 have expected G4 SR higher than schools with ratios between 20 and 60 students per classroom	-	Schools with student classroom ratios greater than 60 have expected G7 SR higher than schools with ratios between 20 and 60 students per classroom
Student -teacher ratio less than 30	-	School student teacher ratios of less than 30 are associated with an expected G4 SR about 8% lower than school with a student teacher ratio between 30 and 60 students per teacher	-	School student teacher ratios of less than 30 are associated with an expected G7 SR about 8% lower than school with a student teacher ratio between 30 and 60 students per teacher
Student -teacher ratio greater than 60	+	Schools with student teacher ratios above 60 have higher expected G4 SR than schools with student teacher ratios between 30 and 60.	ns	There is no statistically significant difference between G7 SR between schools with student teacher ratios between 30 and 60 students per teacher and schools with higher student teacher ratios
Teacher experience	+	A 10% increase in the average teacher experience in a school (years of experience) is associated with a 0.7% increase in G4 SR	+	A 10% increase in the average teacher experience in a school (years of experience) is associated with a 0.7% increase in G7 SR
Unqualified teachers	-	Schools where 25% or more of the teachers report no qualification have an expected G4 SR about 20% lower than schools where fewer than 25% of teachers report no qualification	-	Schools where 25% or more of the teachers report no qualification have an expected G7 SR about 10% lower than schools where fewer than 25% of teachers report no qualification
Availability of textbooks	+	Higher ratios of students to English, Mathematics and Zambian Language textbooks are associated with lower G4 SR. While the relationship is statistically robust the effect is small	ns	There was no statistically significant relationship between availability of English, Mathematics and Zambian language textbooks and G7 SR
Sanitation	+	Availability of toilets is associated with higher G4 SR. A school with a student - toilet ratio of less than 50 students per toilet has an expected G4 SR more than 15% greater than a school with no toilets or a ratio of students to toilets greater than 50 to 1	+	Availability of toilets is associated with higher G7 SR. A school with a student - toilet ratio of less than 50 students per toilet has an expected G7 SR nearly 20% greater than a school with no toilets or a ratio of students to toilets greater than 50 to 1
Teacher housing	-	Schools providing teacher housing have lower G4 SR compared to similar schools that do not provide teacher housing	+	Schools providing teacher housing have about a 7% higher expected G7 SR
Percent of female students	-	A higher percentage of female students is associated with lower G4 SR for the school. However the effect is quite small - a 10% higher percentage of female students lowers the expected G4 SR by only about 1.4%	ns	There is no statistically significant relationship between the percent of the students who are female and the G7 SR
"0verage' students	+	Higher percentages of students overage for grade are associated with higher survival rates - a 10% increase in the percentage of overage students is associated with about a 4% higher G4 SR	-	The percentage of students overage for grade is associated with lower G7 SR, but the impact is small with a 10% increase in the percentage of overage students being associated with just a 1% decline in G7 SR
Orphans	+	Similar to the relationship between overage students and G4 SR but with a much smaller effect.	ns	There is no statically significant relationship between the percentage of enrolment in the school that are orphans and G7 SR
Bursaries	+	There was a positive association with the number of bursaries provided but the impact was quite small. Increasing the ratio of bursaries to students by 10% is associated with an increase of 0.15% G4 SR	+	There was a positive association with the number of bursaries provided but the impact was quite small. Increasing the ratio of bursaries to students by 10% is associated with an increase of 0.06% G& SR
Boarding	ns	Providing boarding places is not associated with statistically significant differences in G4 SR	ns	Providing boarding places is not associated with statistically significant differences in G7 SR
Pregnancy rate	-	The reported pregnancy rate is associated with lower G4 SR. However given impact is small. Reducing the percentage of reported pregnancies by one-half (50%) would only improve expected survival rates by about 1%	-	Similar to grade 4 survival. Statistically significant but very small impact.
Total variation in SR explained by resource variables	**60%**		**30%**	

ANNEX 2: MULTIVARIATE ANALYSIS OF THE TRANSITION TO POST-PRIMARY EDUCATION

Dependent = log of transition rate G7 to G8

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-1.638989	0.681054	-2.407	0.0182	*
survival rate to G7	0.195882	0.077874	2.515	0.0137	*
log of % of G7 enrollment that are orphans	0.003888	0.137057	0.028	0.9774	
log of % G7 enrollment attending private school	-0.016893	0.014892	-1.134	0.2597	
log of % G7 enrollment attending community school	0.025243	0.014699	1.717	0.0894	.
log of mean teacher experience	0.161526	0.254149	0.636	0.5267	
log of pregnancy rate in G7	0.011391	0.020995	0.543	0.5888	
log of % of zones offering G8	0.875132	0.097638	8.963	4.48E-14	***
log of % of G8 enrollment with bursary	-0.461732	0.412351	-1.12	0.2658	
log of % G8 enrollment boarding	-0.013893	0.014065	-0.988	0.3259	
log of % G7 enrollment overage for grade	-0.241905	0.099162	-2.439	0.0167	*
% of zones with at least 40% ratio of bursaries to orphans	0.141028	0.320433	0.44	0.6609	

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2872 on 89 degrees of freedom
(1 observation deleted due to missingness)
Multiple R-squared: 0.6628, Adjusted R-squared: 0.6212
F-statistic: 15.91 on 11 and 89 DF, p-value: < 2.2e-16

ANNEX 3: MULTIVARIATE ANALYSIS OF LEARNING OUTCOMES (GRADE 7)

Dependent = log of per cent of examinees scoring credit, merit or distinction on grade 7 English

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-1.36084	0.353289	-3.852	0.000121
School level G7 survival rate	0.012587	0.040745	0.309	0.757415
Log of enrollment	0.089096	0.045246	1.969	0.049068
student -classroom ratio 60-100	0.089645	0.047161	1.901	0.05746
student -classroom ratio 100+	0.018142	0.0652	0.278	0.780845
student -classroom ratio < 20	0.096899	0.179319	0.54	0.589
log of % of female enrollment	0.308709	0.207038	1.491	0.136094
Teacher houses provided (>2 teachers per house)	-0.10446	0.071763	-1.456	0.145629
Teacher houses provided (<2 teachers per house)	-0.17851	0.063269	-2.822	0.004825
student-text ratio grades 1 to 4	0.011524	0.007419	1.553	0.120466
student-text ratio grades 5 to 7	-0.00467	0.007366	-0.634	0.526213
> 25% teachers w/out qualification	-0.03258	0.123648	-0.264	0.792187
student-teacher ratio > 60 <85	0.119341	0.064304	1.856	0.063613
student-teacher ratio > 86	-0.12269	0.049103	-2.499	0.012541
student-teacher ratio < 30	-0.24659	0.070102	-3.518	0.000445
log of pregnancy rate in school	-0.01119	0.009385	-1.192	0.233264
preschool ratio to G1 less than 50 %	0.074825	0.093196	0.803	0.422135
preschool ratio to G1 50% or more	0.216975	0.109629	1.979	0.047928
student - toilet ratio 50 or less	0.080984	0.051549	1.571	0.116331
log of % of orphans in school	-0.00852	0.013208	-0.645	0.51901
log of mean teacher experience in school	0.026877	0.064317	0.418	0.67608
log of % overage for grade in school	0.027405	0.019638	1.395	0.163016
log of ratio bursaries to students in school	-0.00436	0.007265	-0.6	0.548525

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ignif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

standard error: 0.8668 on 2089 degrees of freedom

(107 observations deleted due to missingness)

R-squared: 0.04059, Adjusted R-squared: 0.03049

tatistic: 4.018 on 22 and 2089 DF, p-value: 1.112e-09

Dependent = log of per cent of examinees scoring credit, merit or distinction on grade 7 English exam

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-2.00472	0.22555	-8.888	< 2e-16	***
Log of spending per student materials/infrastructure	0.06193	0.03827	1.618	0.105774	
Log of spending per student teachers	0.10252	0.02703	3.792	0.000153	***
Log of spending per student tsupplemental support	0.01148	0.01109	1.036	0.300496	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8656 on 2215 degrees of freedom
Multiple R-squared: 0.01136, Adjusted R-squared: 0.01002
F-statistic: 8.487 on 3 and 2215 DF, p-value: 1.323e-05

ANNEX 4: DISTRICT CHARACTERISTICS AND LEARNING OUTCOMES

Log of district % grade 7 English results credit, merit or distinction

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.414298	0.28228	-1.468	0.1459	
Log % of basic education enrollment attending private school	0.025246	0.013289	1.9	0.0609	.
Log % district basic education enrollent in school with toilets at 50 to 1 or less	-0.004274	0.020127	-0.212	0.8324	
Log % district basic education enrollment that are orphans	0.104455	0.062349	1.675	0.0975	.
Log % district basic education enrollment in school with S-T ration >30 & < 60	0.041127	0.094233	0.436	0.6636	
Log % district basic education enrollment in school offering preschool at 50 percent or more of grade 1 enrollment	-0.014151	0.016248	-0.871	0.3863	
log of the ratio of basic education bursaries to basic education orphans	0.038235	0.020514	1.864	0.0658	.
Log % district basic education enrollment in school offering preschool at 50 percent or more of grade 1 enrollment	-0.036607	0.085794	-0.427	0.6707	
Log % district basic education enrollment in school that has 7 grades or more	0.168216	0.197744	0.851	0.3973	
Log % district basic education enrollment in school where textbook ratio for key texts grades 1_4 less than 2 students per book	-0.026749	0.121205	-0.221	0.8259	
Log % district basic education enrollment in school where student -classroom ratiom 100 pr greater	0.005678	0.044928	0.126	0.8997	
Log % district basic education enrollment in school where 25% or more of teachers have no qualification	0.016496	0.033722	0.489	0.626	
Log % district basic education enrollment in school where textbook ratio for key texts grades 5_7 less than 2 students per book	-0.004968	0.124397	-0.04	0.9682	
Log % of district basic education enrollment attending community school	-0.03017	0.030047	-1.004	0.3182	
Log % of district basic education enrollment attending public school	-0.120596	0.159527	-0.756	0.4518	
Log % of district basic education enrollment in school with student -teacher ration less than 30	-0.014744	0.023475	-0.628	0.5316	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2139 on 85 degrees of freedom
(1 observation deleted due to missingness)
Multiple R-squared: 0.2172, Adjusted R-squared: 0.07905
F-statistic: 1.572 on 15 and 85 DF, p-value: 0.09898

Log of district % grade 9 English results credit, merit or distinction

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.414298	0.28228	-1.468	0.1459	
Log % of basic education enrollment attending private school	0.025246	0.013289	1.9	0.0609	.
Log % district basic education enrollent in school with toilets at 50 to 1 or less	-0.004274	0.020127	-0.212	0.8324	
Log % district basic education enrollment that are orphans	0.104455	0.062349	1.675	0.0975	.
Log % district basic education enrollment in school with S-T ration >30 & < 60	0.041127	0.094233	0.436	0.6636	
Log % district basic education enrollment in school offering preschool at 50 percent or more of grade 1 enrollment	-0.014151	0.016248	-0.871	0.3863	
log of the ratio of basic education bursaries to basic education orphans	0.038235	0.020514	1.864	0.0658	.
Log % district basic education enrollment in school offering preschool at 50 percent or more of grade 1 enrollment	-0.036607	0.085794	-0.427	0.6707	
Log % district basic education enrollment in school that has 7 grades or more	0.168216	0.197744	0.851	0.3973	
Log % district basic education enrollment in school where textbook ratio for key texts grades 1_4 less than 2 students per book	-0.026749	0.121205	-0.221	0.8259	
Log % district basic education enrollment in school where student -classroom ratiom 100 pr greater	0.005678	0.044928	0.126	0.8997	
Log % district basic education enrollment in school where 25% or more of teachers have no qualification	0.016496	0.033722	0.489	0.626	
Log % district basic education enrollment in school where textbook ratio for key texts grades 5_7 less than 2 students per book	-0.004968	0.124397	-0.04	0.9682	
Log % of district basic education enrollment attending community school	-0.03017	0.030047	-1.004	0.3182	
Log % of district basic education enrollment attending public school	-0.120596	0.159527	-0.756	0.4518	
Log % of district basic education enrollment in school with student -teacher ration less than 30	-0.014744	0.023475	-0.628	0.5316	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2139 on 85 degrees of freedom
(1 observation deleted due to missingness)
Multiple R-squared: 0.2172, Adjusted R-squared: 0.07905
F-statistic: 1.572 on 15 and 85 DF, p-value: 0.09898

Dependent = log of % of examinees scoring credit, merit or distinction on grade 7 English exam

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-2.3074	0.80897	-2.852	0.00533	**
Log of spending per student materials/infrastructure	0.0194	0.06513	0.298	0.76642	
Log of spending per student teachers	0.24941	0.08886	2.807	0.00607	**
Log of spending per student supplemental support	-0.03317	0.04849	-0.684	0.49561	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2101 on 95 degrees of freedom
(3 observations deleted due to missingness)
Multiple R-squared: 0.1156, Adjusted R-squared: 0.0877
F-statistic: 4.14 on 3 and 95 DF, p-value: 0.008353

Dependent = log of % of examinees scoring credit, merit or distinction on grade 9 English exam

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-1.15901	1.39502	-0.831	0.40818	
Log of spending per student materials/infrastructure	-0.15459	0.11314	-1.366	0.1751	
Log of spending per student teachers	0.51009	0.15315	3.331	0.00124	**
Log of spending per student supplemental support	-0.17905	0.08355	-2.143	0.03469	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3618 on 94 degrees of freedom
(4 observations deleted due to missingness)
Multiple R-squared: 0.1414, Adjusted R-squared: 0.1139
F-statistic: 5.158 on 3 and 94 DF, p-value: 0.002408

ANNEX 5: INDICATORS FOR A PROPOSED DISTRICT EQUITY INDEX

THE ORIGIN OF THE INDICATORS

The district equity tracking index is a set of indicators to support education authorities to develop strategies and plans for improving equity and to monitor and track progress. The district equity indicators are intended to supplement rather than replace other education system reporting. The indicators were developed through application of various statistical methods to identify barriers to pupils reaching higher educational attainment (levels of schooling) and learning outcomes (exam results). Each proposed indicator was chosen because of an observed relationship with survival rates to Grade 4, 7, and 9 and/or ECZ annual exams in English and mathematics. The specific indictors identified as having observable impact on survival rates and/or learning outcomes are:

1. Physical accessibility to schools and/or programs
2. Student individual characteristics (gender and age)
3. Teacher provision and quality
4. School programs and facilities
5. Supplemental support for pupils (bursaries)

A NOTE ON MEASUREMENT FOR TRACKING EQUITY

Assessing equity requires having a picture of how outcomes (survival rates and exam results) and public investments in education differ for students. Two districts with nearly identical percentages of pupils reaching Grade 7 may have very different distributions of those results. In one district, the rate of survival to Grade 7 could be very similar across most schools, while in the other district with the same average result, there could be a number of schools with very low percentages of pupils reaching Grade 7 offset by a group of schools with very high levels of success in retaining pupils to Grade 7. The same consideration is important for promoting effective investment for improving equity. For example, in districts with very similar district level student-teacher ratios, the experience of pupils in schools can look quite different with some districts having relative parity across all schools while others have more extremes of low and high student-teacher ratios.

Since understanding how results and resources are distributed is important for targeting interventions and investment to improve equity, the equity index tracking indicators are constructed to capture the distribution of important factors in a district. While this distributional focus of the indicators is somewhat different than the regular reporting of school census results, they are based on and have been calculated using school census data or ECZ exam results. While most of the

indicators proposed have been identified through an analysis of the relationship between school/student characteristics, resources available, and outcomes (survival rates and exam results), additional indicators that track important equity results directly are also included in the in equity tracking index.

In addition to the numerical value, each indicator is also color coded. For most of the indicators, red indicates that the district value for the indicator is in the bottom 25 percent of all districts. Indicator values that fall within the middle 50 percent of indicator values are coded yellow and values in the top 25 percent are coded green. In some cases the color coding has been added less systematically when the interpretation of results doesn't conform readily to this interpretation. For example, it is not clear that a gender parity ratio of 1.2 in exam results represents a better or more equitable outcome than a 1.0 result. In the case of access to toilets or preschools, it would be difficult to provide a green code to even the best performing districts when those important resources are scarce across all districts.

PHYSICAL ACCESSIBILITY

- In the equity assessment, complete primary schools (to at least Grade 7) had higher survival rates to Grade 4 that similar schools that had less than seven grades.
- The availability of Grade 8 places in more zones within a district had a positive impact on the percentage of pupils who transitioned to post-primary education (Grade 7 to Grade 8) regardless of the total number of Grade 8 places available or differences in student characteristics.

PROPOSED M&E EQUITY TRACKING

1. Percent of basic education enrollment in the district attending a school that is complete to Grade 7 (or higher)
2. Percent of zones within the district that have at least one class (20 students) enrolled in Grade 8.

AGE AND GENDER OF STUDENTS

- Higher percentages of children overage for grade (two years or more) in a school are associated with lower Grade 7 survival rates (but not Grade 4). Higher percentages of overage Grade 7 pupils in a district are associated with lower transition rates to post-primary school (Grade 8).
- Survival rates for girls are similar to those for boys to Grade 4 and show a slight disadvantage for girls at Grade 7. The percentage of girls enrolled in Grade 7 is positively associated with higher district rates of transition to post-primary education (Grade 8). Pregnancy rates of Grade 7 girls in a district was not associated with lower rates of transition to Grade 8. Gender parity in survival rates to Grades 7 and 9 does differ by district.
- Nationally, there is gender parity in English and mathematics exam results at Grade 7 and Grade 9, but parity does vary by district.

PROPOSED M&E EQUITY TRACKING

1. Percent of Grade 1 to 4 enrollment two years or more overage for grade
2. Gender parity in Grade 7 district survival rates
3. Gender parity in district primary transition rate (Grade 7 to 8)
4. Gender parity in Grade 7 English exam results
5. Gender parity in Grade 9 English exam results

TEACHERS

- Student-teacher ratios had a mixed relationship with Grade 4 and Grade 7 survival rates. Schools with very low student-teacher ratios had lower survival rates than schools with "typical" student-teacher ratios (30-60 pupils per teacher). Schools with higher student-teacher ratios (above 60) did not perform differently than schools with typical student-teacher ratios.
- The mean level of teaching experience in a school was associated with higher survival rates to Grade 7. Higher per student spending on teachers was estimated via a model capturing differences in teacher allocation, experience, and qualification and was associated with higher Grade 7 survival rates and higher Grade 7 English exam results. Survival rates to Grade 4 and Grade 7 were considerably lower in schools where 25 percent or more of the teachers did not report any qualification.

PROPOSED M&E EQUITY TRACKING

1. Percent of district basic enrollment attending school with 25 percent or more teachers without qualification
2. Mean school-level spending per student on teachers[65] in the district

SCHOOL PROGRAMS AND FACILITIES

- Schools that offer preschool places in significant numbers[66] have higher Grade 4 and Grade 7 survival rates than similar schools that do not: about 15 percent higher for Grade 4 and 10 percent for Grade 7.
- Schools where toilets are available at a ratio of 1 toilet per 50 pupils or lower have higher survival rates to Grades 4 and 7 (10-15 percent higher) than similarly resourced schools with lower provision of toilets (more than 50 pupils per toilet).

PROPOSED M&E EQUITY TRACKING

1. Ratio of five- and six-year-old preschool pupils in district to new Grade 1 entrants in district
2. Percent of district basic education enrollment that attends a school where preschool enrollment is at least 50 percent of Grade 1 enrollment
3. Percent of district basic education enrollment attending school with student-toilet ratio of 50 to 1 or less

[65] Estimated through investment model: see page 19.
[66] See page 13 for description of proxy variable for preschool offering.

SUPPLEMENTAL SUPPORT FOR STUDENTS

- There was no strong evidence linking the provision of bursaries to survival rates to Grade 4 and 7 or to transition rates from primary to post-primary education (district-level Grade 7 to 8 transition). As discussed in the main body of the paper, individual-level data is required to more accurately assess the impact — or lack of impact — of bursaries on student outcomes. The analysis of school-level data also suggests that bursaries may not be targeted in an efficient manner.

PROPOSED M&E EQUITY TRACKING

1. Ratio of number of all bursaries to number of orphans (one and two parent). Assuming that all bursaries were effectively targeted to orphans, this ratio would represent the percentage of orphans receiving a bursary.
2. Correlation of bursaries provided in schools and number of orphans in a school. (A perfect correlation of one bursary for each orphan would yield a correlation coefficient of 1.0)

FINANCIAL EQUITY

- An investment model was used to translate the physical (infrastructure, equipment, and materials) and human (teachers) resources into an estimate of the total school-level spending per student in each basic education school.

PROPOSED M&E EQUITY TRACKING

1. Mean school-level spending per student yielded by the investment model
2. Gini coefficient of per student total school-level spending within the district. (The Gini coefficient is an indicator of inequality: the larger the number the more inequality of per student total spending within the district).

		Physical Access		Age and Gender of students					Teachers		School programs & facilitie			Sup. support		Financial equity	
Region	District	% of basic enrollment that attends a complete primary school (to grade 7 or higher)	% of a district's zones offering grade 8	% of grade 1 to 4 enrollment two years or more overage for grade	Gender parity grade 7 survival rates	Gender parity grade 7 - grade 8 transition rate	Gender parity grade 7 English exam results	Gender parity grade 9 English exam results	% of basic enrollment attending school with 25% or more teachers without qualification	Mean school level spending per student on teachers	Ratio of 5 and 6 year old preschool students to new grade 1 entrants	% of basic education enrollment that attends a school where preschool enrollment is at least 50% of grade 1 enrollment	% of basic education enrollment attending school with student toilet ratio of 50 to 1 or less	Ratio of number of bursaries to number of orphans	Correlatio of bursaries in schools and number of orphans in a school	Mean school level 'spending' per student	Inequality of per student school level spending within the district (gini coefficient)
Central	Chibombo	20%	88%	19%	79%	100%	111%	109%	4%	363	na	0%	1%	0.01	0.04	490	0.27
	Chisamba	92%	80%	18%	94%	111%	114%	120%	20%	894	4%	2%	5%	0.08	0.42	1,051	0.33
	Chitambo	78%	100%	36%	78%	93%	88%	100%	29%	594	0%	0%	13%	0.05	0.32	729	0.33
	Itezhi Tezhi	85%	88%	25%	114%	92%	106%	114%	12%	882	0%	0%	3%	0.07	0.26	1,048	0.28
	Kabwe	89%	100%	16%	100%	102%	103%	111%	15%	2,122	11%	9%	29%	0.20	0.11	2,557	0.42
	Kapiri Mposhi	92%	87%	22%	68%	106%	112%	107%	3%	841	3%	3%	2%	0.09	0.07	988	0.31
	Luano	90%	75%	18%	97%	78%	98%	86%	44%	374	0%	0%	0%	0.00	na	498	0.38
	Mkushi	79%	79%	23%	103%	101%	100%	98%	17%	865	6%	5%	8%	0.06	0.50	1,147	0.48
	Mumbwa	91%	92%	15%	107%	104%	109%	121%	24%	769	6%	4%	4%	0.07	(0.02)	926	0.35
	Ngabwe	93%	67%	23%	238%	144%	103%	129%	9%	586	0%	0%	0%	0.00	na	766	0.18
	Serenje	85%	67%	26%	98%	98%	95%	85%	23%	749	2%	2%	8%	0.17	0.54	916	0.39
Copperbelt	Chililabombwe	91%	86%	11%	129%	94%	119%	123%	4%	2,321	19%	26%	32%	0.03	(0.10)	2,688	0.33
	Kalulushi	85%	80%	13%	90%	89%	116%	98%	4%	1,696	18%	9%	22%	0.01	0.04	2,027	0.42
	Kitwe	78%	71%	16%	96%	91%	104%	100%	24%	1,572	17%	16%	18%	0.17	0.50	1,847	0.56
	Luanshya	79%	75%	12%	112%	92%	112%	109%	32%	1,656	12%	16%	41%	0.24	0.14	1,978	0.34
	Lufwanyama	72%	100%	19%	95%	101%	105%	118%	29%	779	0%	0%	1%	0.20	0.54	939	0.38
	Masaiti	81%	90%	18%	106%	117%	112%	110%	11%	995	8%	6%	11%	0.06	0.16	1,178	0.35
	Mpongwe	93%	92%	22%	74%	126%	106%	148%	3%	1,035	3%	2%	5%	0.16	0.26	1,205	0.36
	Mufulira	77%	100%	17%	107%	109%	111%	109%	13%	1,589	10%	7%	25%	0.09	0.06	1,857	0.44
	Ndola Urban	76%	80%	15%	88%	66%	103%	102%	20%	2,031	14%	16%	30%	0.17	0.10	3,051	0.57
Eastern	Chadiza	92%	100%	47%	78%	90%	90%	137%	1%	1,052	13%	11%	32%	0.15	0.18	1,248	0.18
	Chipata	72%	100%	28%	96%	103%	102%	120%	4%	747	4%	1%	8%	0.23	0.32	907	0.33
	Katete	75%	100%	40%	82%	113%	88%	106%	15%	769	9%	9%	12%	0.24	0.05	968	0.32
	Lundazi	85%	89%	31%	79%	100%	84%	94%	20%	562	1%	0%	16%	0.03	0.09	726	0.36
	Mambwe	87%	55%	32%	75%	102%	98%	97%	13%	833	2%	2%	19%	0.21	0.17	1,038	0.29
	Nyimba	78%	69%	48%	87%	98%	90%	91%	6%	943	1%	0%	10%	0.07	0.14	1,163	0.25
	Petauke	87%	78%	47%	79%	94%	91%	77%	25%	814	6%	2%	18%	0.11	0.12	996	0.28
	Sinda	79%	45%	53%	95%	73%	na	na	14%	760	0%	0%	8%	0.20	0.39	959	0.32
	Vubwi	95%	100%	45%	80%	99%	83%	100%	0%	829	7%	4%	40%	0.38	0.44	1,041	0.18

		Physical Access		Age and Gender of students					Teachers		School programs & facilitie			Sup. support		Financial equity	
Region	District	% of basic enrollment that attends a complete primary school (to grade 7 or higher)	% of a district's zones offering grade 8	% of grade 1 to 4 enrollment two years or more overage for grade	Gender parity grade 7 survival rates	Gender parity grade 7 - grade 8 transition rate	Gender parity grade 7 English exam results	Gender parity grade 9 English exam results	% of basic enrollment attending school with 25% or more teachers without qualification	Mean school level spending per student on teachers	Ratio of 5 and 6 year old preschool students to new grade 1 entrants	% of basic education enrollment that attends a school where preschool enrollment is at least 50% of grade 1 enrollment	% of basic education enrollment attending school with student toilet ratio of 50 to 1 or less	Ratio of number of bursaries to number of orphans	Correlatio of bursaries in schools and number of orphans in a school	Mean school level 'spending' per student	Inequality of per student school level spending within the district (gini coefficient)
Luapula	Chembe	90%	100%	30%	62%	94%	76%	117%	3%	674	7%	7%	7%	0.03	0.38	792	0.19
	Chienge	85%	86%	36%	88%	111%	88%	48%	11%	659	10%	5%	1%	0.22	0.19	818	0.3
	Chipili	79%	100%	28%	69%	104%	105%	121%	7%	729	3%	0%	10%	0.57	0.61	910	0.4
	Kawambwa	89%	77%	20%	88%	99%	89%	128%	9%	1,082	5%	1%	15%	0.07	0.21	1,442	0.46
	Lunga	87%	67%	33%	44%	60%	76%	96%	7%	577	0%	0%	0%	0.19	0.27	715	0.28
	Mansa	79%	100%	26%	96%	107%	94%	79%	2%	990	13%	2%	13%	0.06	0.56	1,200	0.42
	Milenge	83%	75%	39%	107%	71%	84%	91%	14%	695	14%	9%	28%	0.13	0.64	881	0.3
	Mwansabombwe	88%	100%	44%	82%	117%	96%	96%	2%	1,083	6%	2%	13%	0.09	0.34	1,275	0.22
	Mwense	82%	100%	26%	81%	122%	86%	104%	4%	773	3%	0%	7%	0.30	0.41	942	0.37
	Nchelenge	79%	100%	23%	70%	96%	84%	87%	9%	1,053	9%	3%	4%	0.24	0.30	1,452	0.54
	Samfya	88%	92%	33%	69%	87%	83%	84%	7%	1,029	9%	9%	3%	0.14	0.22	1,223	0.39
Lusaka	Chilanga	95%	100%	16%	88%	105%	106%	98%	7%	1,225	12%	11%	22%	0.35	(0.02)	1,528	0.45
	Chirundu	81%	86%	24%	80%	91%	82%	120%	22%	811	8%	0%	15%	0.12	0.25	1,213	0.42
	Chongwe	83%	100%	24%	98%	115%	109%	97%	7%	1,243	7%	2%	11%	0.19	0.38	1,520	0.49
	Kafue	82%	90%	20%	100%	88%	107%	96%	21%	1,336	10%	5%	20%	0.27	0.04	1,633	0.38
	Luangwa	86%	100%	23%	95%	135%	84%	110%	0%	1,182	9%	2%	19%	1.02	0.06	1,571	0.33
	Lusaka	85%	100%	25%	101%	91%	101%	98%	23%	1,720	21%	12%	17%	0.15	0.30	2,097	0.47
	Rufunsa	92%	100%	25%	120%	97%	105%	127%	24%	761	6%	5%	13%	0.31	0.59	941	0.26
	Shibuyunji	82%	83%	23%	110%	96%	106%	109%	7%	1,121	16%	2%	7%	0.09	0.36	1,398	0.46
Muchinga	Chama	78%	87%	25%	70%	104%	72%	140%	14%	884	5%	5%	3%	0.08	(0.06)	1,095	0.29
	Chinsali	84%	44%	29%	208%	180%	93%	118%	9%	997	0%	1%	11%	0.18	0.43	1,199	0.32
	Isoka	88%	36%	30%	107%	62%	86%	76%	5%	937	8%	3%	14%	0.25	0.22	1,153	0.23
	Mafinga	95%	30%	26%	114%	100%	86%	85%	10%	727	4%	3%	2%	0.02	0.47	915	0.3
	Mpika	77%	80%	20%	84%	108%	98%	103%	24%	674	4%	2%	10%	0.09	0.15	845	0.41
	nakonde	87%	62%	21%	116%	111%	95%	110%	9%	1,389	6%	1%	13%	0.09	0.54	1,692	0.5
	Shiwangandu	89%	54%	26%	72%	97%	110%	100%	10%	982	0%	0%	15%	0.11	0.38	1,180	0.3

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North Western	Chavuma	79%	75%	21%	78%	94%	95%	84%	12%	1,191	0%	0%	5%	0.12	0.46	1,475	0.34
	Ikelenge	81%	100%	32%	77%	93%	91%	118%	30%	826	2%	0%	9%	0.19	0.31	1,075	0.47
	Kabompo	84%	67%	20%	108%	107%	94%	95%	22%	654	6%	2%	13%	0.29	0.21	856	0.38
	Kasempa	91%	100%	26%	79%	119%	97%	133%	16%	1,252	0%	0%	15%	0.21	0.41	1,469	0.32
	Manyinga	91%	100%	21%	74%	97%	103%	102%	7%	822	0%	0%	3%	0.44	0.79	1,029	0.28
	Mufumbwe	83%	100%	21%	108%	107%	100%	100%	14%	939	0%	0%	0%	0.20	0.75	1,091	0.32
	Mwinilunga	88%	78%	24%	70%	93%	91%	97%	24%	787	4%	2%	7%	0.39	0.48	981	0.37
	Solwezi	86%	100%	25%	97%	97%	104%	106%	11%	1,003	3%	1%	3%	0.18	0.14	1,310	0.46
	Zambezi	70%	92%	23%	85%	182%	97%	na	20%	804	2%	0%	2%	0.05	0.10	984	0.35
Northern	Chilubi	85%	64%	36%	131%	91%	60%	78%	17%	658	10%	5%	6%	0.05	0.08	805	0.28
	Kaputa	87%	29%	33%	85%	88%	83%	96%	10%	858	7%	5%	14%	0.05	0.37	1,018	0.28
	Kasama	82%	100%	30%	87%	116%	95%	122%	19%	921	4%	2%	13%	0.22	0.47	1,148	0.43
	Luwingu	90%	5%	28%	82%	50%	90%	107%	13%	824	5%	4%	15%	0.48	0.18	1,034	0.3
	Mbala	91%	46%	31%	84%	119%	84%	104%	19%	769	3%	2%	17%	0.20	0.21	987	0.3
	Mporokoso	80%	41%	24%	87%	100%	82%	92%	22%	756	5%	3%	17%	0.32	0.01	960	0.33
	Mpulungu	88%	30%	30%	93%	110%	78%	88%	14%	660	5%	1%	0%	0.10	0.62	812	0.34
	Mungwi	78%	50%	26%	72%	84%	79%	68%	21%	682	5%	6%	13%	0.08	0.32	817	0.31
	Nsama	91%	12%	24%	75%	25%	67%	61%	11%	663	3%	4%	23%	0.04	0.48	798	0.32
Southern	Chikankata	93%	100%	21%	100%	91%	109%	110%	11%	958	4%	1%	20%	0.02	0.17	1,171	0.31
	Choma	91%	91%	21%	109%	111%	116%	124%	7%	1,278	4%	4%	30%	0.19	0.32	1,545	0.33
	Gwembe	79%	88%	27%	106%	92%	98%	89%	31%	832	17%	16%	10%	0.31	0.01	1,063	0.34
	Kalomo	80%	93%	25%	93%	93%	111%	111%	14%	839	12%	10%	12%	0.13	(0.05)	1,039	0.32
	Kazungula	90%	82%	15%	80%	98%	112%	140%	19%	859	13%	10%	21%	0.06	0.22	1,079	0.4
	Livingstone	93%	100%	12%	111%	103%	106%	110%	10%	1,799	17%	16%	44%	0.55	0.33	3,847	0.62
	Mazabuka	91%	92%	16%	93%	105%	105%	111%	2%	1,445	5%	3%	17%	0.05	0.18	2,077	0.49
	Monze	88%	100%	19%	88%	92%	121%	110%	6%	1,265	6%	4%	26%	0.10	0.76	1,515	0.39
	namwala	82%	100%	30%	110%	100%	131%	120%	26%	753	0%	0%	7%	0.10	0.50	930	0.26
	Pemba	88%	100%	23%	78%	80%	124%	128%	13%	1,006	0%	0%	22%	0.07	0.50	1,145	0.22
	Siavonga	73%	67%	28%	99%	106%	102%	94%	13%	715	8%	10%	18%	0.02	(0.07)	893	0.35
	Sinazongwe	77%	100%	28%	67%	117%	92%	100%	14%	874	13%	11%	19%	0.16	(0.05)	1,080	0.36
	Zimba	88%	100%	32%	92%	78%	95%	88%	29%	727	5%	4%	6%	0.60	0.17	929	0.22

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Western	Kalabo	85%	85%	25%	91%	87%	94%	103%	5%	851	10%	1%	7%	0.10	0.50	1,055	0.28
	Kaoma	70%	80%	19%	97%	100%	103%	112%	4%	947	4%	2%	17%	0.26	0.71	1,156	0.43
	Limulunga	96%	88%	17%	100%	97%	95%	110%	7%	1,303	2%	7%	17%	0.19	0.17	1,563	0.2
	Luampa	90%	60%	24%	83%	112%	94%	93%	8%	793	0%	0%	19%	0.04	0.36	976	0.27
	Lukulu	88%	100%	14%	85%	101%	92%	144%	13%	949	8%	1%	7%	0.29	0.41	1,183	0.23
	Mitete	86%	75%	15%	76%	88%	93%	113%	8%	873	0%	0%	0%	0.02	0.09	1,131	0.31
	Mongu	83%	100%	13%	98%	111%	104%	119%	5%	1,316	6%	4%	26%	0.30	0.37	1,566	0.36
	Mulobezi	5%	100%	8%	118%	83%	114%	133%	95%	41	0%	0%	1%	0.01	0.48	182	0.28
	Mwandi	88%	80%	14%	93%	89%	140%	104%	3%	1,390	9%	0%	22%	0.06	(0.03)	1,663	0.49
	nalolo	92%	75%	19%	113%	96%	90%	110%	9%	835	0%	0%	0%	0.10	(0.01)	1,022	0.26
	Nkeyema	92%	67%	20%	87%	100%	102%	114%	2%	1,009	0%	0%	13%	0.01	0.15	1,150	0.19
	Senanga	80%	86%	17%	101%	74%	102%	118%	13%	1,119	3%	1%	6%	0.24	0.15	1,344	0.37
	Sesheke	86%	56%	18%	82%	118%	100%	131%	2%	1,082	11%	0%	4%	0.37	0.77	1,346	0.36
	Shangombo	48%	100%	24%	95%	80%	83%	130%	30%	474	1%	0%	0%	0.09	0.50	652	0.45
	Sikongo	95%	67%	32%	88%	92%	97%	132%	5%	918	4%	4%	3%	0.04	(0.08)	1,125	0.26
	Sioma	88%	64%	23%	116%	102%	117%	100%	4%	936	18%	10%	8%	0.23	0.47	1,149	0.3

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